FOOD SOVEREIGNTY, GENDER AND TRANSITIONS IN TRADITIONAL CULINARY KNOWLEDGE IN THE CHINANTLA, OAXACA, MEXICO

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Shoshana Devra Perrey

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ABSTRACT

Over the last four decades, agrarian communities in Mexico have encountered various factors causing a transition from food self-reliance to dependence on industrial food supply chains. This shift has challenged these communities' food sovereignty, that is, their right to determine their own food systems and those systems' management on their own terms, free from external corporate intervention. Women's rights and contributions to knowledge production are central to food sovereignty discourses, because food procurement, preparation, feeding, and teaching children about cooking traditions are largely the domain of agrarian women's knowledge. To better understand the interrelated factors affecting these transitions, I will investigate how gendered experiences have changed over time in regards to: (1) traditional culinary knowledge (TCK), (2) seed conservation, (3) perceptions of agrobiodiversity, and (4) the underlying socio-political reasons for these changes.

I chose to conduct a case study in the Chinantla region of Oaxaca, Mexico because it is a center of agrobiodiversity, and the territory is managed locally as "indigenous and community conserved areas", both approaches that are supportive of the concept of food sovereignty. I conducted participant observation and 40 semi-structured household interviews with Chinanteco women and men. The interviews investigated adult family members' opinions, experiences, and perspectives on changes and factors that have affected agrobiodiversity, seed conservation and TCK. Women and men who participated in this study indicated they have been saving and growing native seed *in situ* for family consumption and preparing traditional cuisine for generations, but that the last forty years have brought many changes. Research participants provided context-rich examples of cuisine that used native, heritage, wild, and non-native purchased foods, which I analyzed to demonstrate how transitions manifest in the reproduction

and heritability of TCK. With this data set, I comparatively analyze community-managed initiatives aimed at improved public health outcomes, seed conservation and the preservation of agrobiodiversity. I then discuss more broadly the implications of transitions in TCK as potential barriers to and possibilities for achieving food sovereignty.

My findings reveal benefits for corporate food production at the expense of women's knowledge and work. Women's management of agrobiodiversity and TCK are disrupted by the influx of industrial foods. Further negative effects on agrobiodiversity and TCK were attributed to climate change, conservation zoning, highway construction, and nutrition program interventions. I argue that TCK is an important indicator of several other tenets of food sovereignty, namely agrobiodiversity, women's equitable inclusion, locally controlled food systems management, and preservation of culturally-appropriate foods, but this has not received enough examination within current discourses. My case study provides examples of how food sovereignty and TCK diminish when women's equitable inclusion in social and political concerns is not prioritized. Agrobiodiversity declines with the introduction of industrial foods through market-based sales and nutrition interventions. On a broader level, this research has important implications for nutrition development programs that target populations in "indigenous and community conserved areas". My findings point to the significance of integrating native foods and traditional cuisine into environmental and nutrition development programs and their related curriculums, when working with indigenous communities. Finally, I suggest preventative measures to conserve heritage seed varieties that carry cultural and nutritional significance for indigenous farmers' food production and TCK, thus moving them toward food sovereignty.

BIOGRAPHICAL SKETCH

Shoshana is a National Science Foundation Graduate Research Fellow who has field research experience in tropical agroecological farming with peer-to-peer family farmers residing in conservation zones and protect areas. Born and raised in the San Francisco Bay Area, she developed a passion for northern California's coastal bio-cultural diversity by accompanying her mother during sea urchin harvesting in Moss Beach, as a young girl. Before beginning college, Shoshana devoted herself to the environmental justice and food sovereignty movements by working with community groups on racial equality and improved health outcomes in segregated neighborhoods in San Francisco, CA and New Orleans, LA. Numerous international urban and rural farming experiences have deepened her research interests of food sovereignty, agroecology and cuisine in in California, New York, southern France, Madagascar, Galápagos, and Mexico.

In Ithaca, NY, Shoshana is the owner and chef of Liberation Supper Club, a farm-to-table and wild foods catering service that cultivates a sense of place by telling the story of where food comes from. She helped start an organic blueberry u-pick farm CSA in Van Etten, NY. In Oakland, CA she has worked with Food First: Institute for Food and Development Policy, and applied her permaculture design skills to the Mills College Campus Farm. Following Hurricane Katrina, she contributed her first responder skills to collaborate and support grassroots organizations' and residents' restoration and return efforts in New Orleans, LA.

In 2009, Shoshana's baccalaureate thesis researched gender and food security in relation to fair trade certification of vanilla beans. On the volcanic island of Nosy Komba, Madagascar, she conducted interviews with women and men farmers in the Ambariovato Cooperative, a fishing and farming community that grew fair-trade certified vanilla in shaded polyculture, cooperative farms.

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With all my gratitude,

"Xochitl"

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LIST OF ABBREVIATIONS

CBD	Convention on Biological Diversity
CCT	Conditional Cash Transfer
CEPCO	State Coalition of Coffee Producers of Oaxaca

	(Coordinación Estatal de Productores de Café de Oaxaca)
CONABIO	National Commission for the Knowledge and Use of Biodiversity *(Comisión Nacional para el Uso y Conocimiento de la Biodiversidad)*
CONAFOR	National Forest Commission *(Comisión Nacional Forestal)*
CORENCHI	Committee of the Natural Resources for the Chinantla (*Comité de los Recursos Naturales de la Chinantla*)
FSD	Food Sovereignty Diploma
GMO	Genetically Modified Organism
INMECAFE	Mexican Coffee Institute *(Instituto Méxicano de Café)*
NAFTA	North American Free Trade Agreement
NGO	Non-governmental Organization
PEHS	Payments for Environmental and Hydrologic Services
TCK	Traditional Culinary Knowledge
UNESCO	United Nations Educational, Scientific and Cultural Organization
WPP	Women and Politics of Place

Introduction

This research examines food sovereignty, gender and the transitions in traditional culinary knowledge (TCK) in the Chinantla region of Oaxaca, Mexico. I define traditional culinary knowledge as the teaching and learning of technologies, practices, rituals, traditions, arts, social relationships and performances associated with foods that are identified within the community, family and environmentally-specific contexts. Over the last four decades, agrarian communities in Mexico have encountered various factors causing a transition from food self-reliance to dependence on industrial food supply chains (Barkin 1987 and 1990; Nyéléni 2007; Rodriguez-Gomez 2013), which I argue has shifted traditional culinary knowledge to adapt and change with sociopolitical factors and economic development. This shift has challenged these communities' food sovereignty, defined here as their right to determine their own food systems and those systems' management on their own terms, free from external corporate intervention (Desmarais 2007; Wittman, Desmarais and Wiebe 2010). The call for food sovereignty as a human right in Mexico is deeply challenged by the dominance of national and transnational corporate food and agriculture policies, the North American Free Trade Agreement (NAFTA), class and racial differences, and deep-seated *machismo*, or masculine power structures in Mexican society (Nyéléni 2007; Baker 2013; Rodriguez-Gomez 2013). Women's rights and contributions to knowledge production are central to food sovereignty discourses, because food procurement, preparation, feeding, and teaching children about cooking traditions are largely the domain of agrarian women's knowledge (Butler 1990; Allen and Sachs 2007; Christie 2008; Park, White and Julia 2015). Mexican food sovereignty actors prioritize the protection of agricultural-biological diversity, or agrobiodiversity, rooted in the traditional and cultural heritage of native plants that comprise the *milpa* system (Fitting 2011; Baker 2013; Rodriguez-

Gomez 2013). The *milpa* is centered on maize and beans, and incorporates chilies, squash and field greens (*quelites*), among other plants. The *milpa* is more than an ancient intercropped farming system, it is way of life for indigenous communities in the Americas, where the cultural preservation and biological conservation has historically relied on the gendered division of labor as women have been the primary stewards of plant food and medicine resources while men managed hunting and fishing (Grey and Patel 2015; Park et al. 2015). Global and industrial models of monocropped commodity food chains operate in stark contrast to the heterogeneity of the *milpa* system, localized informal and formal markets, trade systems and communal land systems characterized by indigenous communities throughout Mexico. In response, the Mexican food sovereignty movement presents a crucial lens with which to resist the viable threats to native maize varieties (Fitting 2011; Baker 2013; Rodriguez Gomez 2013) and indigenous women's knowledge which is tied to food production, feeding and cuisine. In Mexico, the opponent to native foodways – industrial maize surplus commodities imported from the US – threaten the very survival and heritability of agrobiodiversity, native seed stock and the traditional culinary knowledge that accompanies local food sources.

Conservationists and food systems researchers have been increasingly concerned with the future of agricultural biological diversity because of its global decline over the last century (FAO 2010; Ibarra et al. 2011; Jackson et al. 2012; Bezner Kerr 2014; Montenegro de Wit 2015; Grenade and Nabhan 2015). In this study, agrobiodiversity includes the objective categories of genetic resources of plants, animals, fungi, microorganisms and biological components of the soil that are important to food and agriculture, "which result from the interaction between the environment, genetic resources and the management systems and practices used by people (FAO 1999)." Landrace seeds are defined as a genetically and physically diverse collection of a

domesticated plant species that has adapted to a region over time (Colley and Zystro 2015), which Mexican farmers refer to as *"nativo"* or native seeds (Louette, et al. 1997). Heritage food sources (also known as heirloom varieties) are defined as open-pollinated cultivated crops that have been grown and shared from generation to generation within a family or community (Colley and Zystro 2015), which Mexicans refer to as *criollo* seeds. The term "*criollo*" captures the scope of landrace varieties, heritage plant foods and animals to refer to native foods, or "foods from here." In a wide range of regional cuisines across Mexico, native varieties of maize, beans and other cultivated food crops are interwoven with wild, spontaneous and gathered foods from forests to create quotidian dishes as well as ritual, celebratory feasts (Adapon 2008; Kennedy 2010). Native, homegrown maize is the foundational staple ingredient for the Mexican diet, appearing in every meal of the day through beverages such as *atole* and *popo*, steamed and fried dumplings like *tamales* and *empanadas*, and the ubiquitous flatbread *tortilla*. The wide range of dishes in Mexican cuisine is emblematic of the nation's extensive cultural diversity and agro-biological diversity, and provides an important subject for research because it demonstrates farmers' and cooks' social and political response to diversity decline.

In this way, I present traditional culinary knowledge (TCK) as a form of knowledge about biocultural diversity, which Maffi (2001:600) defines as the intimate link between biological, linguistic and cultural diversity. Oaxaca state is one of the major centers of biodiversity and agrobiodiversity in the world (Nabhan 2009; CONABIO-UNDP 2009) and the center of cultural diversity in Mexico (Schmal 2003; Burton 2007). According to the Mexican Census, Oaxaca is home to the largest number of distinct indigenous cultures in Mexico (Schmal 2003; Burton 2007), which draws attention to the growing body of research linking the coexistence of linguistic-cultural diversity with the diversity of indigenous groups' knowledge

and management of their contextualized biological diversity (Maffi 2005; Nazarea 2005; Kassam 2009; Jacques and Jacques 2012, Nabhan 2013). As simply stated in Jacques and Jacques (2012: 2972), "Cultural and biological diversity co-evolve in complex and constitutive feedbacks, and their losses are also complex." With more area than any other state in Mexico, Oaxaca's biological diversity has been increasingly protected through the 463,000 hectares enlisted as protected areas by either state, federal or voluntary protection status (CONABIO-UNDP 2009), including the indigenous and community conserved area in the Chinantla region. Archeological evidence of maize seeds found in sites in the Tehuacan Valley have concluded that Puebla and Oaxaca states are a Vavilov center and global origin of maize cultivation, where farmers have bred landrace seeds *in situ* for an estimated ten thousand years (Nabhan 2009; Blancas et al 2010; Fitting 2011). The continued existence of edible plants through human intervention are aided by both *in situ* (in habitat) and *ex situ* (removed from habitat) approaches (Tuxill and Nabhan 2001), but *in situ* reproduction requires the preservation of plant seeds in their agroecosystem of origin where farmers use their own knowledge of selection methods and criteria (Louette , Charrier and Berthaud 1997; Brush 2004). Indigenous knowledge of *in situ* seed conservation is a contextualized expression of the food sovereignty movement in Mexico, and is inextricably linked to the diverse cultural and ethnic groups who inhabit Oaxaca's multiple complex topographical bioregions. Two Oaxacan bioregions in particular are recognized by the World Wildlife Federation for extraordinarily high species endemism: the Pacific coast tropical dry forests in the south and west, and the Northern Range, known as the *Sierra Norte*, along the northeastern border of the state (Oviedo 2002), where the Chinantla is located. In these bio regions, maize varieties are considered contiguous biocultural artifacts of the diverse indigenous communities populating the mountainous terrain. Thus, this research is premised on the concept

that traditional culinary knowledge is a form of biocultural knowledge that is threatened by the decline of native maize diversity in Mexico.

Indigenous agrarian communities throughout North and Latin America have cited native seeds, foods and their associated traditional knowledge as some of the benchmarks of their cultural identity and resistance to colonization through food sovereignty (Grey and Patel 2015; Icaza 2015; Henderson 2017). Yet, seed varieties, food and traditional knowledge are not static, and indigenous communities confront social, political and environmental obstacles that challenge them to shift their activities, adapt their practices and change their traditions over time. Analyzing these social changes require an attention to the political governance of land, food and programs that interact with community's governance and control over their biocultural resources. In this research, I examine the gendered changes and the role that food plays in embodied memory, that constitutes heritable biocultural knowledge invoked by their contextual relationship to place (Maffi 2001, 2002; Harmon 2001, 2002; Kassam 2009). This biocultural knowledge is passed by women and men, with a focus on the particular domains of knowledge attributed to women for seed conservation, cooking, feeding and teaching about food.

I opted to study local practices in two communities in the highly biodiverse region of Oaxaca known as the Chinantla, home to the indigenous group Chinantecos. My research design was qualitative, as it was based on gaining an understanding of how socio-political events shaped the gendered management of food systems and the perceptions, experiences and opinions of how it changed over time. I designed open-ended questions in semi-structured and unstructured household interviews in order to invite participants to use their own narratives to contextualize the food system in their community. Furthermore, it allowed for the possibility of novel and

unique suggestions to emerge for how to preserve agrobiodiversity, seeds and TCK for future generations. My research was driven by the following questions:

a) What are the relationships between agrobiodiversity, *in situ* seed conservation, and TCK in the Chinantla region of Oaxaca, Mexico?
b) How have the gendered practices in farming activities, seed conservation and TCK changed over time, and what are the underlying reasons for these changes?
c) How have socio-political events affected agrobiodiversity, seed conservation and TCK in this region and what solutions do women and men suggest for preserving these traditions for future generations?

In the next section, I provide a review of relevant literature to provide background on these questions.

Literature Review

Agrobiodiversity

This section provides context to the multiple elements that define agrobiodiversity, as it fits into my first research question, "What are the relationships between agrobiodiversity, *in situ* seed conservation, and TCK in the Chinantla region of Oaxaca, Mexico?" I begin by observing the global recognition of biodiversity within Mexico. Then, I focus in on shifting cultivation as an agricultural practice that characterizes agroecosystems in the Chinantla. I then present background on the concept of bio-cultural diversity, relating it to this research as it pertains to seed conservation and wild food resources. In this brief overview, I demonstrate how agrobiodiversity has become a global subject of concern that has propelled international political calls to action and localized efforts for conservation.

According the Convention of Biological Diversity (2005), "the main pressures on and drivers of change to biodiversity are classified under six themes: ecosystem degradation and loss; overexploitation of species; introduction of invasive alien species; pollution; climate change; and urbanization." Of interest to this study, the CBD called on all participating nations for the enhanced capacity of indigenous and local communities to develop strategies and methodologies for *in situ* conservation, sustainable use and management of agrobiodiversity, building on indigenous knowledge systems. This call to action would necessitate that indigenous communities participate in the development and implementation of national strategies, plans and programs for agrobiodiversity, through decentralized policies and plans, and local government structures. Mexico was recognized by the CBD as a mega-diversity nation, which encompassed wild and cultivated animal and plant species. Beginning in 2003, The National Forestry Commission (CONAFOR) and CONABIO have managed policies and parent programs to disseminate a national agenda for conserving biodiversity (CONABIO-UNDP 2009). Among

these programs are economic initiatives based on economic compensation targeted at agrarian populations residing in protected areas. Payments for hydraulic-environmental services (PEHS) apply a monetary value to hydraulic and environmental services, with the aim to incentivize and modify behaviors by agrarian populations to protect biodiversity and manage ecosystems, while purportedly including them in the marketplace of the conservation economy (Rico García-Amado et al. 2011; CONABIO-UNDP 2009; CONAFOR 2013; Shapiro-Garza 2013). In the Chinantla region, the Committee for Natural Resources in the Chinantla (CORENCHI) is a prime example of a community-based management association created by indigenous farmers who monitor territory, protect plant and animal biodiversity, hydraulic resources, prevent deforestation and distribute PEHS to landowners.

Shifting cultivation practices[1] that incorporate controlled burns of the *milpa* have been the subject of controversy between CONAFOR's conservation regulations as dictated by CBD goals (2005), because smoke pollution, loss of forest cover and biomass is considered to counteract the carbon sequestration services provided through agroforestry, secondary and primary forests. Globally, indigenous communities practice shifting cultivation agriculture, a crop rotation system that has been practiced for hundreds, if not thousands of years. In the case of the Chinantla, in the last few decades industrial farming practices have been introduced into the farming system, such as the application of herbicides. Van der Wall's work on indigenous shifting cultivation practices in the Chinantla (1999) provided a comprehensive analysis of its "iterative and interactive character". His work emphasizes that shifting cultivation is a form of

[1] Shifting cultivation is sometimes referred to as swidden, or slash-and-burn agriculture. For the purposes of this research, I use the term shifting cultivation based on the rigorous research by Van der Wall (1999), who articulated the practices used in Chinantla region.

mosaic management, "which optimally combines diverse conservation and production goals." The Committee for the Natural Resources of the Chinantla (CORENCHI 2013) define the shifting cultivation system with following steps: (a) graze, (b) controlled line burn for 4-5 days, (c) sow maize with hoe, (d) re-sow a second time a few days later (e) sow beans and squash by hand, broadcast seeds mustard and some wild edible greens seeds, (f) weed by hand, (g) clean with herbicide, (h) growth and maintenance period, stack stones over emerging roots, (i) construction of seed storage structure, (j) harvests throughout the year, depending on the crop or wild edible plant's maturation (see Figure 4). Miguel Pinedo-Vasquez of Columbia University's Earth Institute Center for Environmental Sustainability highlights that,

> Swidden-fallow systems maintain a mosaic of fields, fallows, and forests, that is heterogeneous and therefore resilient to climate change. When managed properly—it's essential, for instance, to resist the pressure to farm the fallows too soon—such systems preserve local biodiversity, even as they enable villagers to harvest a broad range of vegetables, herbs, and fruits from the fields and wild medicines and edible plants from the forests (Raygorodetsky 2016).

Seeds and food sources that were once considered "common goods" have become commercialized, improved through industrial and plant genetics research breeding programs, or displaced by external institutions and enterprises importing other interests as maximized productivity, homogenization and profit (Phillips 2013; Kloppenburg 2004). There are both *in situ* (on site) and *ex situ* ways to conserve seeds, and they vary due to the heterogeneous complexity of seeds, their uses, adaptive environments and the objectives of people who steward their reproduction. This study is concerned with farmers' seed conservation practices, and draws from literature that shows that smallholder farmers steward agrobiodiversity through *in situ* seed conservation, (Louette, et al. 1997; Tuxill and Nabhan 2001; Brush 2004).

Various research perspectives have studied the relationship between indigenous communities and their traditional food systems at the local scale, in order to better understand the

conditions that lead to agrobiodiversity decline. Agroecological studies have identified farmer's strategies for planting crops and their reasoning for selecting and conserving native and heirloom seeds, including strategies for food security, climate change adaptation, preserving cultural traditions and political resistance (Brush 2004; Mullaney 2014; Rogé and Astier 2014; Bellon et al 2015). Ethnographic botanical research has investigated the criteria that farmers choose for *in situ* seed conservation in terms of the human uses or services that plants offer to humans (Nazarea 2005, 2013; Arellanes et al. 2013; Kawa et al. 2015). Among these uses and services are foods for their families and communities, feed for their animals, building materials, fuel, medicine, cultural uses for rituals and ceremonies, and environmental uses, such as windbreaks and integrated pest management (Bioversity and the Christensen Fund 2009). Ethnobotanists have documented the value of wild plants for many indigenous communities, recognizing their multifaceted role within traditional food systems and culinary knowledge for both medicinal and culinary uses (Kassam et al. 2010; Moreno-Calles 2016).

Studies have found that many wild plant species used for food simultaneously overlap their meanings and uses with foods commonly eaten for medicines or materials used in rituals (Kuhnlein and Receveur 1996; Nabhan 2002; Kassam et al. 2010, Turner et al. 2011). For example, in Mexico wild edible greens and herbs are often referred to interchangeably and sometimes ambiguously, depending on their use as food, fodder for animals or medicine. Edible wild greens in particular are an important element of the traditional *milpa* agroecosystems throughout Latin America. *Milpa* is the Mexican Spanish word for managed polyculture fields with maize, beans, squash, chilies and spontaneous wild edible greens and herbs, referred to as *quelites,* which would otherwise be considered weeds but which have an important place within TCK. In the *milpa*, wild greens not only offer food for humans, but also provide pollen, nectar

and habitat for beneficial insects and animals within the agroecosystem (Altieri and Whitcomb, 1979). These studies suggest ways that both cultivated and wild foods comprise "ethnoecosystems", which are characterized by indigenous communities' socio-cultural relationships with agrobiodiversity and their local environment (Moreno-Calles 2016).

Social relations and gendered production of TCK

In this section, I outline my epistemological foundation of how "gendered practices" are approached in this research, in regards to my research question, "How have the gendered practices in farming activities, seed conservation and traditional culinary knowledge (TCK) changed over time, and what are the underlying reasons for these changes?" First, I define TCK and articulate its dual nature of material objectivity and cultural subjectivity. Then, I outline the "women and the politics of place" conceptual framework, put forth by Harcourt and Escobar (2005) that combines discourses and social movements about women's bodies, women's rights, their relationship with the environment, and diverse economic struggles and economic justice movements that focus on the division of labor. Lastly, I apply sociological and anthropological nutrition research, and distinguish it from traditional food systems research by differentiating the contextual value of cooking style – cuisine – from nutrition studies that disregard the cultural value of regional difference.

Traditional culinary knowledge is thus defined as the teaching and learning of technologies, practices, rituals, traditions, arts, social relationships and performances associated with local foods that are identified within the community, family and environmentally-specific contexts. It is the breadth of knowledge that integrates local foods within the gendered, social behaviors and activities of cooking and feeding in the home (DeVault 1994), conviviality and eating (Flandrin and Montanari 1999) as performances of agency and knowledge transmission

(Fonte 2008; Delormier, Frohlich, and Potvin 2009). Linking the dualities of material objectivity and cultural subjectivity, I approached my study with the biocultural diversity theoretical frameworks to present research that simultaneously builds from empirical scientific research that documents and archives agrobiodiversity but that does not reduce the meanings and values of knowledge systems and human's co-existence with their environment and culture.

The "women and politics of place" (WPP) conceptual framework highlights the intersectionality of three main domains of (1) body, (2) place/environment, and (3) economy as it has been expressed across social movements and women's actions in different parts of the world (Harcourt and Escobar 2005). At its core, WPP promotes that mobilizing social change must begin with understanding "difference" and "diversity" between and within groups, so that individual actors and groups can articulate their rights based on their different, diverse and unique *experiences in place*: of the body, environment and economy. The WPP framework informs this research through an investigation of, "women's forms of place-based politics without reducing them to any overarching global logic, but seeing them in their own right (Harcourt and Escobar 2005: 6)," which informs this epistemological method. As a white woman with relative class privilege compared to the indigenous women and men participants, my research ethic is to learn and listen to the place-based political and embodied experiences of research participants and collaborators, seeing them in their own right. In this way, the WPP conceptualizes the subject of "diversity" as an inherent reflection of the environment and politics of place with which it identifies, which applies to both women and men. Women's and men's bodies, experiences and knowledges are diverse, and a sense of place is informed by political, economic and environmental experiences.

In this study I apply the WPP framework which incorporates the political relevance of the dimensions of place and cultural diversity when studying TCK. I draw from the feminist theoretical approach of Diana Taylor's (2003) work The Archive and the Repertoire: Performing Cultural Memory in the Americas, which differentiates the archives - a collection of written works, documentation and historical materials - from the category of repertoire of embodied memory, which employs gestures, the spoken word, movement, dance, song, and other performances. Central to Taylor's theoretical differentiation of archive and repertoire is the recognition that repertoire of embodied memory offers politically nuanced perspectives compared to those derived from documented archives, and is particularly useful for considering historical processes of transnational relationships in the Americas. DeVault's work[2] advanced the notion that women's roles in the social relations of the home in particular, promote inequality with men, who were not depended upon for the activity of feeding (1994). Women's roles as home cooks and caretakers can be linked to Taylor's theoretical contributions that embodied knowledge expresses itself through performance repertoires. TCK includes feeding as a set of performative activities, a repertoire of skills, meanings and stories (Gvion 2012) that derive from the women's work roles as caretakers and cooks, as well as carrying the responsibility of teaching this embodied knowledge to their children (Taylor 2003). Joy Adapon's study Culinary Art and Anthropology (2008), provides a historical case for the cultural viewpoints of home cooked foods in Mexico as an art form spanning popular traditions, as opposed to formalized training. Adapon (2008) reviews the extensive body of historical anthropological research that debates whether Mexican cuisine is unique from its influences of European cuisine or indebted

[2] This is not an idea that originated with DeVault; earlier feminist scholars have explored different gender roles in the home.

and weighted by its influences of the ancient traditions of Mexico's numerous indigenous groups and native American foods.

Sociopolitical Context within Mexico

This section addresses the research question, "How have socio-political events affected agrobiodiversity, seed conservation and TCK (in this region) and what solutions do men and women suggest for preserving these traditions for future generations?" I present a brief overview of major sociopolitical events in the indigenous communities in Southern Mexico during the last forty years. Globalization and neoliberal policies resulted in three major crises in the 1990s-2000's with dire impacts on informal and formal maize and coffee markets, public health and agricultural subsidies. Agrarian and indigenous communities responded by either mobilizing through social movements or emigrating in search of alternative income strategies.

Mexican agrarian populations have experienced an increasing influx of foods and goods in the last half century, due to the national agenda to liberalize trade markets and compete in the global capitalist economy (Barkin 1987; Weis 2007; Patel 2012a). The agrarian population is demarcated by 80-90% small- and medium-scale farmers, with the majority of small-scale farmers residing in indigenous communities, and 10-20% large, industrial-scale monocrop plantation corporations (CONEVAL 2013). Small holder farmers' main crops are native maize and beans for family consumption, and a range of cash crops for informal market sales and family consumption. Coffee, sugar cane and rubber have been the most prominent cash crops in southern Mexico since the late 1800s, particularly in mountainous regions populated by majority low-income, indigenous farmers (Bezaury 2003). Until the mid-1990s, indigenous people farmed 80% of the total area devoted to coffee in Oaxaca, with individual smallholders operating on 5 hectares or less (Toledo and Moguel 1996). In the late 1980s, Mexican agricultural trade policies

and programs encouraged farmers to enter the agro-export market, in a national directive to globalize agriculture markets and redirect them from populist or communist state control (Barkin 1990; Bezaury 2003).

The results of the Mexican government's globalization and trade policies were disastrous for Mexico, provoking a series of three national crises. The first was the Crisis of 1989-1994 that was in part caused by the Mexican government's cancellation of the Mexican Coffee Institute (Bezaury 2003). Known as INMECAFE, this national institute provided purchasing power, financial infrastructure and training support to smallholder coffee producers (Bezaury 2003). When INMECAFE was dismantled, trade liberalization weakened the entire Mexican coffee market, driving farmgate coffee prices down for producers. Simultaneously, the plant disease coffee leaf rust devastated coffee agroforestry systems, resulting in a steady decline in crop yields. In 1989, in response to the crisis and poverty it created, 21,000 smallholder coffee growers formed the State Coalition of Coffee Producers of Oaxaca (CEPCO).

The second crisis was the implementation of NAFTA, beginning in 1994, which had many trade liberalization effects, including driving native maize prices down in order to compete with US subsidized, industrial maize (Fitting 2011). Although a minority of mid-scale maize producers prospered through transnational competition, the majority of small scale producers were forced to undersell their surplus stock when confronted with the influx of cheap, imported industrial grain with which they could not compete (Patel 2012a). Millions of smallholders were unable to compete and abandoned their farms, migrating north to work (Wise, Salazar and Carlsen 2003; Weis 2007; Patel 2012). Despite the intention of capitalist economic integration, NAFTA resulted in a rupture within and between Mexican formal and informal economies, with

great consequences for the middle class and agrarian workers throughout the southern states (Wise, Salazar and Carlsen 2003; Weis 2007; Patel 2012).

In 2007-8, the third crisis – known as the Tortilla Crisis – was caused by NAFTA's spike in tortilla prices, the dietary basis of food for Mexicans. In January, 2007 the price of tortillas jumped from $3.50 pesos/kg to $10-$12/kg (Rodríguez-Gómez 2013), causing a major revolt among urban and rural groups. In response, the Mexican food sovereignty group formed called *Sin maíz no hay país y sin frijol tampoco* (There is no country without our domestically-produced corn and beans) led mainly by academics (Rodríguez-Gómez 2013). They launched a nation-wide campaign to fight for the biocultural and political rights to food for the rural and urban poor producers and consumers who were hardest hit by NAFTA (Baker 2013; Rodríguez-Gómez 2013). The major insult was that maize had always been the most Mexican-identified food harking back to pre-conquest historical empires, but Mexican tortillas were being produced from US maize and sold to Mexicans in a post-colonial dependency nightmare (Patel 2012; Rodríguez-Gómez 2013). Rather than providing infrastructure support for native agricultural production, the Mexican state responded with a neoliberal agenda of poverty-reduction measures targeting *pobres* (poor people) rather than *campesinos* (staple-food agricultural producers). The impact directly affected consumers who purchased tortillas, and indirectly affected small-holder farmers who grew their own maize for tortillas when shortages in supply caused them to have to purchase grain for consumption.

The Tortilla Crisis coincided with a major shift in dietary patterns connected to NAFTA, which in turn have had detrimental health impacts, especially higher rates of obesity and type-two diabetes (Rull et al 2005). The increased incidence of type 2 diabetes has been attributed to the nutrition transition. Popkin (1993) defines the nutrition transition as a complex process

whereby hunter-gathering societies abandon local dietary traditions and transitioned to increased dependence on industrial foods and dietary patterns, with wide-reaching adverse impacts on local self-sufficiency, food quality, variety, and negative consequences for public health. Type-2 diabetes is one such public health problems, a disease attributed to increased starch consumption and the increased consumption of high-sugar foods and beverages (i.e. Coca Cola). In Mexico, it has become the most grave health problem in the last 4 decades, cited as the principal cause of death in women and the second in men since the year 2000 (Rull et al 2005). Farmers and urban consumers alike, united in the movement *Sin maíz no hay país y sin frijol tampoco*, adhered to the objective to resist planting non-native grain as part of the food sovereignty agenda to resist or reject genetically modified organisms (GMOs) (Fitting 2011; Baker 2013; Rodriguez-Gómez 2013) and reestablish a Mexican cultural protection and heritage for their native cuisine, rooted in heritage foods and saving the health of the Mexican people.

This place-based political movement confronted head-on the state-led transition towards neoliberal, trans-national trade in defense of the fundamental heritage of native Mexican maize. Mobilized political action groups directly rejected the national agricultural policy agenda. The claim was the Mexican government policies prioritized increased economies of scale, and the importation of corporate-owned foods at the disastrous expense of domestic production, public health and declining consumption of native maize and tortillas (Fitting 2011; Baker 2013; Rodriguez-Gómez 2013). In the struggle against corporate intervention in the food system, the fight for food sovereignty has articulated itself in diverse and place-based expressions, spanning race, class, gender, agrobiodiversity, food production and consumption. In Mexico, food sovereignty must also include the relevance of unique and regional expressions of cuisine.

Methodology and Data Collection

I investigated the relationship between seed conservation and TCK as the main driver for the preservation of *in situ* agrobiodiversity. Since the Chinantla is rich in both agrobiodiversity and TCK, the research objective was to reach a better understanding of how to re-value and reach solutions that *comuneros* suggested to avoid negative health outcomes, agrobiodiversity loss and preserve TCK for future generations. My research method used qualitative data collection in a case study design, taking place in two communities. In order to understand the perspectives, experiences and activities of women and men participants, I presented open-ended questions, and followed up with participants to ask if there were gendered patterns or incidences in regards to all questions.

Field research data was collected from March – May 2016, during which time I conducted semi-structured and unstructured interviews, participant observation, a workshop and a focus group. I also observed and/or participated in numerous community events that provided insight into the social and political relationships in both communities. This was an ideal time to conduct field research for the participants because it was between harvests, so they were more likely to be available in the evenings, even though they worked during most daylight hours. My positionality as a graduate-level researcher from the US, a Spanish speaker with previous research experience in Oaxaca, fostered my ability to evaluate the relationships between actors, their natural resources, the environment and local knowledge in the Chinantla.

To foster initial access to the research communities, the Municipal Property Offices (*Bienes Comunales* in Spanish) were presented a Letter of Introduction to request permission to conduct research, a sample interview guide (see Appendix) with questions that would be asked of participants, and a blank form indicating the confidential data that I would collect. Then, the project proposal was presented in front of each community's General Assembly, to explain the

benefits and risks to participating in the project. Free prior informed consent was requested and obtained at each General Assembly, and then again with participants before the community workshop, focus group and household interviews. This process of informed consent was based upon a commitment to follow professional codes of ethics from the Declaration of the Rights of Indigenous Peoples, and the Belmont Report's subsections on International Human Research and Children. The research protocol was approved by the Cornell Institutional Review Board (Protocol # 1601006051).

Background on the Chinantla Case Study Sites

The research was located in the Chinantla region of Oaxaca state, in two communities within the Municipality of San Felipe Usila (Figure 1). Situated in the heart of the Sierra Madre mountain range, Oaxaca state is a notable Vavilov center of agrobiodiversity in the world (Nabhan 2013) because its home to *teocintle*, the wild crop relative of maize, and is the origin of maize cultivation (Trigo 2004) where farmers have bred landrace seeds and cultivated heritage foods *in situ* for an estimated ten thousand years (Blancas et al. 2010; Nabhan 2009). The Chinantla region has been a noteworthy "indigenous and community conserved area", receiving special protective status for jaguar, tapir, butterflies and orchids, among many other species, representing a wide range of natural habitats, wildlife species, agricultural and pastoral species and landscapes. For its rich wildlife species, it has received increasing research attention by conservation biologists and environmental scientists (Bray et al 2012).

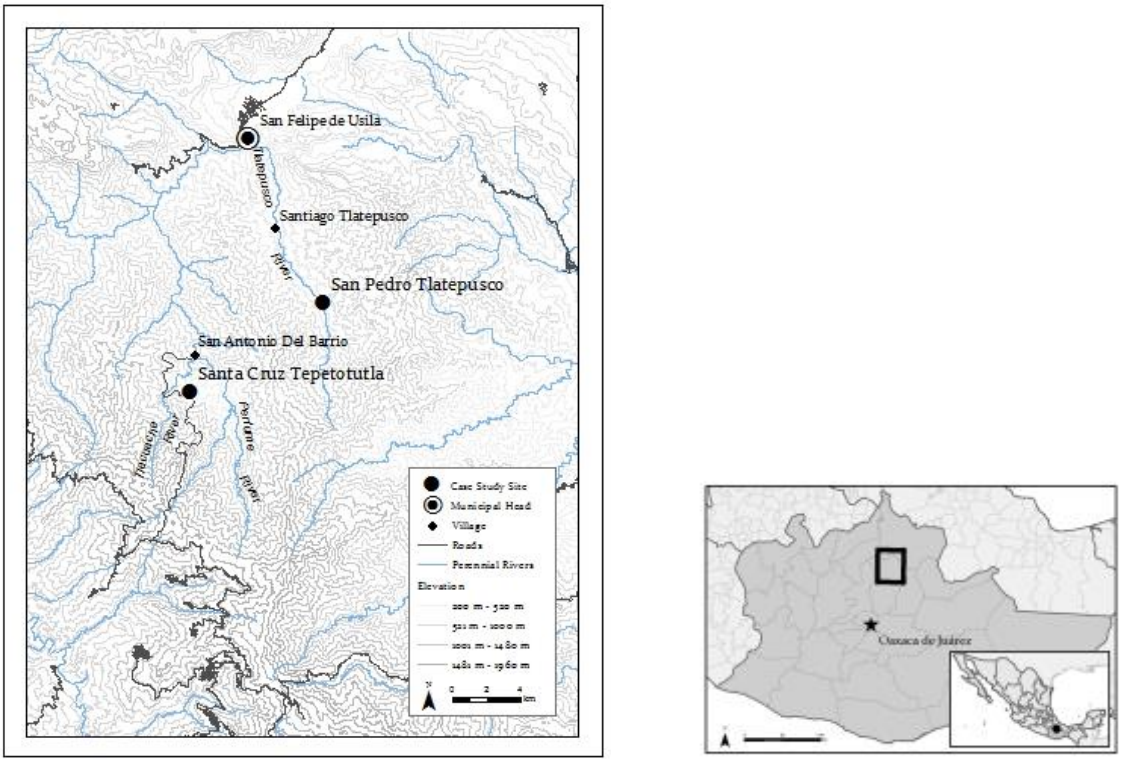

Figure 1. Case study area in the Chinantla region: Municipality of San Felipe de Usila (left) and Map of Oaxaca (right). 2016. Map by Martin Ziech; Cornell University Library Map Collection.

I selected these communities for my case study because they are home to indigenous peasant farmers practicing *in situ* agrobiodiversity conservation who live in the highly biodiverse, mountain region of the Chinantla of Oaxaca State. Their ancestors have inhabited the southern Sierra Madre Mountains since well before Spanish conquest (Bevan 1938), practicing collective communal governance of cloud forest territory, which were documented in the *Titulo of Guatinicamane,* one of the earliest colonial transcripts (potentially dated to 1550) to recognize Chinantecos' sovereignty. It purports local leaders' interests in protecting the territory from Spanish rule while inviting the establishment of Christianity with the integrity of local rule (van Doesburg 2012). This document was said to set the conditions for cultural, political and economic reproduction by protecting territory and resisting the kind of political invasion that

characterized the Central Valleys of Oaxaca (Bevan 1938). The collective memory inherent in political identity was consistent with the neighboring indigenous groups of the Zapoteco, Mazateco, and other mestizo peoples in the Sierra Madre (Zuany 2014; Luna-José and Rendón Aguilar 2012). Following the land-redistribution measures of the 1910 Revolution, Oaxaca state established Municipal Property Offices to delegate and document community-owned landholdings. In many indigenous communities where Municipal Property Offices manage the local governance, smallholder farmers were rightfully entitled to small-sized land parcels as long as families managed their own agricultural production systems.

The state of Oaxaca's mountainous terrain is home to dozens of agrarian indigenous groups in hundreds of small villages comprised of smallholder farmers. These mountains rise thousands of feet encircling the high plateau of the semi-arid Oaxaca Valley (Bellon et al. 2004). In the steep mountains of the Chinantla cloud forest, the majority of smallholder farms of 1-300 hectares each are patchworked concentrically around small community village centers, usually marked with a church and the Communal Property office.

Collaborators

I collaborated with a group of Community Technicians, who facilitated conservation programs and ecotourism services in their respective communities, on behalf of the organization CORENCHI (The Committee for Natural Resources in the Chinantla Alta, or *Comite de los Recursos Naturales de la Chinantla Alta*). CORENCHI was legally formed in 2005 in order to collectively organize and manage conservation areas, and educate community members about the conservation regulations enacted by CONAFOR, the National Department of Forestry. "The new community leadership was strengthened in its belief in the inherent value of conservation and its perception that conservation could produce income to counteract emigration due to continued

instability in coffee prices (Bray, Duran, and Molina-Gonzalez 2012:162)." In 2004, the market-based mechanism of payments for environmental and hydraulic services (PEHS) was instated by a partnership between CORENCHI and the civil association Geo Conservación. Six communities from the Chinantla originally signed on as CORENCHI communities, and began receiving PEHS based on eligible landholdings that were deemed to be carbon sinks and biodiversity habitats, thus providing important ecosystem services for conservation (Table 1). I also collaborated with Geo Conservación, a civil association based in Oaxaca City that provided various ecological assessments and research liaison services in several parts of the state, including the Chinantla Region. Geo Conservación and CORENCHI are responsible for the case-study communities' historical designation as an "indigenous and community conserved area", and helped facilitate my introduction to local authorities as well as transportation to the region, which was only reachable by their private transportation.

The collaborative quality of my research was based on previous participatory research conducted in the Chinantla by members of CORENCHI in the form of the Food Sovereignty Diploma (FSD)[3] held in 2013. Principal researcher Diana Denham offered the course, teaching qualitative research methods to technicians of CORENCHI, resulting in a diploma of completion. Community technicians trained for their certificate by conducting qualitative research in households across four villages in Chinantla, including semi-structured interviews, oral histories,

[3] People referred to this program casually by calling it simply, el diplomado, or the diploma. When more formal, they'd call it el Diplomado en la Soberanía Alimentaria, or the Food Sovereignty Diploma, which is how the alumni presented it in their final project, a website that included all their research findings: http://soberaniaalimentariacorenchi.blogspot.mx/. According to CORENCHI data files, it was officially recorded as el Diplomado en Investigación Comunitaria Sobre Sistemas Alimentarios (DICSSA), or the Diploma in Community Research on Food Systems.

focus groups and participant observation, and the synthesis of their results in a public website (CORENCHI 2014). In the FSD, data provided insight into farmers' crop yields, food varieties, household size, dietary consumption and other data contributing to their survey on food security. Interviews conducted with elder community members drew attention to the importance of traditional cuisine to preserve agrobiodiversity and protect against the increased incidence of diseases related to metabolic and gastric syndromes, which elders attributed to the dietary consumption of "junk food", among other conditions related to nutrition behaviors. The FSD data presented by CORENCHI contributed to the integration of a participatory research methodology, whereby *comunero* participants framed research in their own terms, based on the concepts, methods and results that mattered most to them.

The FSD community-based research dataset provided baseline qualitative data for my fieldwork regarding local food systems, but their dataset was incomplete in regards to TCK. The FSD resulted in little data on traditional dishes, food preparation practices, and efforts to preserve specific ingredients and the customs that accompany them. Based on my preliminary review of the FSD data, I expected that daily dietary and culinary customs may have seemed like common knowledge to the people who practice them. Perhaps community members and CORENCHI didn't consider the valuable links that existed between seed conservation, agrobiodiversity and TCK. This compelled me to question why there was a gap in the research. Therefore, part of my goal was to learn how to prepare and taste food in the Chinantla, the associated dietary habits and health outcomes there and discuss the meanings of and historical changes that affected TCK.

I visited four communities in the region, and conducted research in two communities who received PEHS from CONAFOR: Santa Cruz Tepetotutla and San Pedro Tlatepusco. Due to

logistical challenges, I visited but did not conduct research in San Antonio del Barrio and Santiago Tlatepusco. I expect my findings and conclusions would have been different if I had been able to work in all four communities (for reasons elaborated upon in the Limitations section). CORENCHI and Geo Conservación recommended contacts for initial introductions to community officials and provided collaborative and logistical support throughout the research.

Data Collection

Fieldwork data collection involved qualitative methods including: a) community workshop or focus group, respectively in each community, b) semi-structured and unstructured interviews, and c) participant observation (Table 1).

Table 1. Case Studies Qualitative Data Collection, Demographic and Geographic Data. *Communal Conservation Area certified by the National Commission for Protected Conservation Areas - (see [n/d Mondragon])

Data Collection	**Santa Cruz**	**San Pedro**	**Totals**
Semi-Structured Interviews (*M= Men, W=Women*)	*M=8 W=7* Total=15	*M=11 W=14* Total=25	*M=19 W=21* Total=40
Participant Observation	*M=1 W=5* Total=6	*M=6 W=5* Total=11	*M=7 W=10* Total=17
Community Workshop	*M=12 W=10* Total=22	--	M=12 W=10 Total=22
Focus Group	--	*M=6 W=0* Total=6	*M=6 W=0* Total=6
Age Range of Individuals (lowest<average<highest)	24 < 54 < 96	22 < 38 < 86	22< 46 < 96
Total Individual Interactions	*M=21 W=22* **Total=43**	*M=23 W=19* **Total=42**	*M=44 W=41* **Total=85**
Demographic and Geographic	**Santa Cruz**	**San Pedro**	**Total**
Estimated Population *(Men and Women) according to local authorities*	700	350	1050
Total Area (Hectares)	12,372	6,380	18,752
Communal Conservation Area (Hectares)	9,670*	5,050*	14,720
AREA WITH PEHS 2004-2007 (HECTARES)	3,933	3,978	7,911

Community Workshop and Focus Group

The purpose of the workshop was three-fold: 1) to review data collected by the FSD and address gaps within the context of *comuneros*' perspectives, 2) to facilitate a community dialogue about culinary knowledge and its transitions in the local context, and 3) to stimulate awareness and invite suggestions and propose plans by participants about community activities and next steps in response to the issues raised. The Commissioner of the Municipal Property Office used the registered property owner list to select a purposive sample of 20 *comuneros* and their spouses in each of the 2 communities. Participation was voluntary, confidential, and conducted in Spanish, then translated into Chinanteco when necessary for clarification. Recognizing that I was unfamiliar with community members' schedules, the Commissioner invited participants based on his understanding of their commitments to field activities, family composition and the likelihood of whether they would opt to participate or not. Additionally, three CORENCHI Community Researchers led the workshop. It was held in the Multipurpose Room in the town center, lasted 2 hours and was followed by complementary refreshments for all participants.

Prior to the workshop, I met with the CORENCHI technicians in order to develop an agenda for the workshop based on their expertise and experience with the community and the FSD. Community researchers designed the presentation and constructed a questioning route to engage participation (Kreuger and Casey 2009), including three major themes. The first theme was the Chinantla agricultural calendar, including its agrobiodiversity during each seasonal activity, with descriptors of how climate change and plant diseases have affected certain crops. The second theme reviewed the Community Timeline of historical events that influenced transitions and changes in Santa Cruz. In the third theme, participants discussed traditional

culinary and medicinal knowledge using local, native and heirloom plants, mushrooms and meats, stating that more data collection on this theme is needed to develop community education tools for children and teens.

Participants in the workshop responded to the three themes with their personal experiences, and added support, doubts and/or questions about the data presented, which I noted in my field journal. Drawing from a participatory research and focus group methodological framework (Krueger 2008), I solicited their input about the benefits and challenges of the FSD, and integrated their feedback into my semi-structured interview guide. The workshop fostered a more sensitized and informed approach for me as the researcher to communicate with participants and provided me with an introduction to the local, historical and cultural context.

San Pedro's CORENCHI delegates and community technicians participated in a focus group rather than a workshop. Using purposive sampling, the focus group was held with all available people who were current or prior delegates as Community Technicians with CORENCHI. In attendance were the supplemental President of the Communal Property office, three men delegates who were assigned to assist the two community technicians with CORENCHI related work duties. The three delegates didn't previously attend the FSD nor were they expected to participate in CORENCHI-related duties, unless called upon, which is why they were invited by the supplemental President to join the focus group. The focus group was held in the Communal Property office from 7-10pm in the evening after men had returned from their fieldwork. All participants were provided with free and informed prior consent according to the IRB Protocol.

Semi-structured and Unstructured Interviews

In-depth semi-structured and unstructured interviews aimed to listen to farmers' stories regarding seed conservation of edible plants that have nutritional and cultural value for food security and cultural traditions. I conducted interviews with 40 people total in Spanish, designed for 60-90 minutes each, allowing for a follow-up visit for participants who opted to demonstrate a recipe or seed saving method (see Observation, below). Interviews were conducted in households and on field-visits with individual adults or with multiple family members, over the age of 18. I requested informed consent to participate, record audio, photo and video with all participants, consistent with the approved Cornell IRB Protocol. The majority of participants preferred not to have their voice or image recorded. All interviews were written into my field journal, using an ethnographic field note methodology (Emerson, Fretz, and Shaw 2011). I reviewed field notes daily with my research assistant and translator to confirm language accuracy from Chinanteco to Spanish. The Interview Guide (Appendix) involved open-ended questions in order to understand the various perspectives, experiences and opinions.

Semi-structured interview questions were thematically designed to fit into one of four sections: farming activities, seed conservation, TCK and wrap-up questions about the household. Participants were asked how these themes changed over time, why such changes may have occurred, the gendered division of labor, and what stories, legends, and/or significance represented them within their cosmogony. Unstructured interviews generally included much more personal information that participants voluntarily shared, providing helpful contextual insight to conditions that were not included in the Interview Guide. The unique contexts of the two independent communities dictated varied sampling methods, described below.

Santa Cruz (Community 1): I presented my study to the full assembly of all community members and they approved, by consensus, that I conduct my study in the community. The Commissioner of the Municipal Property Office granted permission to view the community list of property owners, in order to select the households where I would conduct semi-structured and unstructured interviews. He estimated that the population of Santa Cruz was 700 people. The entirety of the population residing in Santa Cruz was farmer families, so all residents on the list were qualified to participate in the study.

I determined to randomly select participants using a random number table to avoid bias imposed by the Commissioner in choosing people who may have had personal relationships with the communal governance structure or CORENCHI. Aiming for a minimum of 10 semi-structured interviews, I asked for 20 names to account for the possibility that those selected weren't available or declined to participate. The list in Santa Cruz contained 361 lines representing households, each line listed with single individual adults or married adult couples (18 years and older). In the households with married couples, the husband was listed first, and his wife second. If a woman was single and registered as a *comunera*, she was listed on her own line, even if she lived in a household with other men *comunero* family members. My decision rule was to divide the total number of cases (n=361) by the total number of case I wanted to choose from (n=20), so I numerated every 18th *comunero*/*a* listed. To choose the first one, I used a random number table (0<360) and selected a random number. The *comunero* listed as that number was selected as the first participant on the list of households, then the next 19 participants were numerated and selected after every 18th *comunero*. In Santa Cruz, I conducted 15 interviews total: 12 semi-structured interviews drawn from the random sample participant list, and 3 unstructured interviews by convenience sample participants (see Table 1).

San Pedro (Community 2): I presented my study to the full assembly of all community members and they approved, by consensus, that I conduct my study in the community. The Commissioner of the Municipal Property Office was unavailable during my research period. His supplemental officer did not feel comfortable signing an agreement in his absence, nor showing me the list of *comuneros*. It is possible that the list was not accessible since the Commissioner kept it in his residence. The supplemental officer estimated that there were approximately 350 adults and children residing in the community, with about 125 people over the age of 18. Instead, he insisted that I conduct interviews with a convenience sample.

Although I was approved by the assembly to conduct household interviews, not all families would be available at all hours due to the *rozo* (controlled field burns), so it was my obligation to present myself at homes or request suggestions for neighbors or family members who were expected to be available, then request their permission to participate at that time. The context dictated the sampling methods which yielded rich results. Since my goal was to collect qualitative data directed towards interested participants with knowledge of culinary traditions, the selectivity of my sample served its purpose, adjusting the sampling methods to the local context. In San Pedro, I conducted a total of 25 interviews, with 22 semi-structured interviews and 3 unstructured interviews.

Participant Observation

Participants discussed research-related issues of importance to them, demonstrated how they saved seeds, harvested food in the fields, prepared traditional culinary recipes using native foods harvested from local seed reserves, and guided visits to their agricultural fields, archeological sites and rivers along paths in the community territory. Photographs, audio and ethnographic field notation methods were used to record observations (Emerson et al. 2011). I

documented my observations of scenes and the people in them to capture detailed records of the attitudes and feelings towards agrobiodiversity, seed conservation and TCK: the methods they used, the conditions and tools used in their fields, homes and kitchens, recipes and ingredients, and the dialogue and facial expressions of participants. These experiences lent important detail to better understand participants' perspectives, meanings and daily experiences.

In addition to participant observation with individuals and households, I attended numerous community events with dozens of attendees. I attended communal governance General Assemblies and PROSPERA meetings in both Santa Cruz and San Pedro, a presentation by Geo Conservación on Recycling and Trash Management in Santa Cruz, the 3rd Annual Fair for Biodiversity and Culture in Santa Cruz and San Antonio del Barrio, the Santa Cruz Anniversary Festival, the Mother's Day Celebration in San Pedro, and a speech by a municipal political candidate in San Pedro.

Data Analysis

Transcripts were translated from Spanish to English, and then combined with handwritten ethnographic field notes from interviews, the community workshop, the focus group and participant observations, to create the dataset. Audio interviews were transcribed and translated, in the same manner. Drawing on grounded theory as set forth by Strauss and Corbin (1990), I synthesized open codes compiled from the dataset in order to explore the major themes, using a Microsoft Word macro document and Excel Spreadsheet.

Findings

Research was conducted in two case study sites in the Chinantla region of Oaxaca, Mexico: First, Santa Cruz Tepetotutla (henceforth referred to as Santa Cruz), then in San Pedro Tlatepusco (henceforth referred to as San Pedro). Due to the qualitative nature of this study's data collection, results from the two communities varied and are described below in their unique contexts. Below, I begin by addressing major findings that arose in both communities. Then, I detail contextual findings when it is relevant to differentiate the two communities' unique responses as a reflection of their contextual conditions and influences. I present opinions, perspectives and narratives in their English translation as they were voluntarily reported, citing participants' who wished to have their statements credited to their name. All others chose to be referred to anonymously, i.e, in the format "woman from San Pedro" or "man from Santa Cruz".

The major findings from the study indicated three notable influences on men and women's TCK since the 1990s: (1) access to cheap, industrial produced foods[4] (due to highway construction and NAFTA policies), (2) declining agrobiodiversity and crop losses which in turn affected the availability of locally produced foods to eat, and (3) the disappearance of trout in the river due to dam construction. Combined, these factors are anticipated to significantly affect the preservation of agrobiodiversity and food sovereignty for indigenous communities in the state of Oaxaca. Moreover, culinary traditions are expected to transition toward the consumption - both purchasing and eating - of foods from outside the community.

[4] This research focuses on food and not other commodities imported following NAFTA, although it is important to recognize that food commodities are packaged into the broader development goals of the state, as both a capitalist project and process (McMichael 2012).

Photo 1. Santa Cruz's central plaza rooftop, church and a few homes, as photographed from the adjacent ridge.

Santa Cruz: Setting and Resource Development

The village of Santa Cruz was estimated at approximately 250 households of 750 people,[5] clustered along the spine of steep mountain ridge, ranging in elevation of 1200 -1500 m. From Interstate Highway 175, which links from Oaxaca City, an unpaved highway was extended in 2012, leading exclusively to Santa Cruz and neighboring village San Antonio del Barrio. The highway has influenced infrastructure and everyday life tremendously, with both positive and negative implications for health, education, agroecosystems, tourism, income generation, communications and social connectivity. Once the highway reaches town, a dirt road continued

[5] In the 2010 Census (INEGI), the population was 429 people living in 110 households, but I report the updated estimates by the Commission President.

through the village (with some newly paved portions constructed during the fieldwork term) running along the ridge called Armadillo Hill, with most homes located on the road for proximity to electricity, and three to four additional streets. The terminus of the road is at the newly constructed Tourist Villa and Community Canning Kitchen. Tlacuache and Perfume Rivers flanked the village, approximately 350-400 meters below on either side of the ridge. Santa Cruz is considered by area specialists to be a mountain village, but one that rests in the transition zone between the "high" and "low" Chinantla biomes.

Dozens of well-trodden trails led to rocky embankments, as well as to ranches and *milpa* parcels. In the past, residents traveled three to four hours by foot to their ranches to tend crops and animals. This tradition was less common at the time of fieldwork, because "the youth don't want to walk so far." The distance made it inconvenient and excessively laborious to carry harvests back to the village, and animals preyed on stored crops at the ranch stock houses, *almacientos,* thus requiring human guards. More recently, men constructed security features – such as metal feet and chicken wire - into the shelters to avert rodents, raccoons, and larger animals from infestation and foraging. According to Bevan (1938:19), many smaller settlements historically arose from people settling permanently closer to their ranches that were very far from the village. San Antonio del Barrio is one such settlement-turned-village, which sits on the junction of the two rivers and was sufficiently lower altitude so as to have warmer climates suitable for growing pineapples and sugar cane.

Historical descriptions of the town were often accompanied by recollections of natural features of the forest, rivers, foods and ranches that have changed over time. Several men referred to the "*pueblo viejo*", "old town" when recalling their childhood, which was located

Photo 2. *Almaciento*, or seed stock house, on a ranch in Santa Cruz.

approximately two to three kilometers away, separated from the current village by a shallow ravine, evidenced by abandoned residential foundations overgrown with brush. The old town was established following a destructive earthquake in the 1910s rendering the present-day location uninhabitable for several years. One community member recounted that it was established as a leprosy colony. Another spoke of the earthquake as a transformative historic event indicating a deep interdependence with wild plant medicines for the survival of Santa Cruz's ancestors. With tears of pride and reminiscent excitement, a man who identified himself as the herbal healer for Santa Cruz said, "Wild pheasants and monkeys were afraid because the land was shifting due to the earthquake. Thirty families founded the new town, and when they got sick with dysentery and diarrhea, an herb cured them all." Several elders in the community espoused the deeply held value that native plant medicine had in their lives, representing a distinct sense of place and pride in Chinanteco identity's connection to the forest. In 1981 the first electric grain mills arrived in

Santa Cruz, which replaced hand-cranked grain mills and the traditional *metate* and *mano*, previously used for grinding maize. By the early 1990s, most households had installed their first electricity connections and outlets, primarily to provide incandescent light at night and to power electric grain mills, an advance that saved considerable labor for women when milling maize for tortillas.

It was hoped that hydroelectric generators installed in the river would provide sufficient energy for the community to fulfill all their needs, as well as surplus kilowatts to sell to Santa Cruz. Due to logistical and infrastructure impediments, electricity was instead provided through state-sponsorship. Santa Cruz received 30 kilometers of electric cable per household, distributed to families who installed the connections themselves from power boxes located on poles along the central road. Gas stoves for cooking were introduced as early as 2000, and though several households had gas stoves in their kitchens, the only household that was observed using it was a designated private *comedor*, or eatery, for tourists and researchers. Many women stated that gas cost money, so it was cheaper to collect firewood for everyday cooking. Gas stoves in homes appeared to be trophies of progress, but not practical for habitual use, instead they were convenient for special occasions or the recent introduction of canning fruit marmalades and pickles. People preferred the flavor of food cooked atop traditional firewood grills and stoves, which used firewood to heat a metal or ceramic *comal*, or griddle.

Photo 3. A church on the central plaza of San Pedro.

San Pedro Tlatepusco: Setting and Resource Development

San Pedro's population slowly increased since its most recent resettlement in 1948, following a catastrophic flood of Tlatepusco River that destroyed all homes in 1928, leaving the village vacant and abandoned for twenty years. Following that vacancy, survivors returned and settled families on the east side of the river, while new families came from neighboring communities during the last sixty years, approximately. In the last decade, three homes were constructed on the steeper western slope above the river. Of an estimated 350 residents, approximately sixty are age ten or under, attending the public school which offers elementary and middle school instruction. Three full-time teachers commuted from San Felipe Usila, to teach Spanish-language elementary school curriculum, with much instruction spoken in Chinanteco Usila dialect, rather than the San Pedro dialect. Children must commute to a town at

least three hours away, or in many cases move to a new residence, to receive formal education above primary school. The community's history of immigration has created a linguistic melting pot of dialects from across the Chinantla. Communication barriers among residents are prevalent due to the presence of at least four distinct Chinanteco dialects. Participation in communal governance was conducted in mixed Spanish and Chinanteco, which reduced verbal participation by women and elders with limited Spanish, although status and gender roles were also a factor in equal participation by both genders. Many elders were limited from participation due to physical impairments and disabilities, including hearing loss, impaired mobility and vision, and illness.

Generally, of married couples who participated in the study, one spouse had moved to San Pedro from a neighboring community for marriage, usually but not exclusively, the wife. Beyond marriage, women who moved to San Pedro often stated that they were content with the more natural lifestyle and proximity to the headwaters of Tlatepusco River, source of the "sweetest water in the Chinantla." Women's - and by extension - mothers' migration brought multiple Chinanteco dialects to San Pedro. Of the 26 villages in the municipality of San Felipe Usila, participants believed that each village spoke its own dialect. Fourteen dialects were officially recognized across the region, based on a linguistic evaluation (Rensch 1989). Men generally spoke a newer, hybrid dialect called Chinanteco of San Pedro, which was creolized from neighboring communities following resettlement since the late 1940s. Women also spoke this Chinanteco of San Pedro dialect, as well as their mother dialect from Santiago Tlatepusco, San Antonio del Barrio, Santa Cruz Tepetotutla or San Felipe Usila. While men were nearly all comfortable communicating in their second language of Spanish, many women declined to participate in household interviews due to their lack of comfort communicating in Spanish. Even with a family-member translator present, approximately 70% of women expressed that they

doubted they *could* contribute "correct information" to the study due to their poor Spanish skills and few years of schooling[6]. It's likely that the original San Pedro dialect transitioned after the flood, as survivors assimilated in other communities, which also implies a change in maize agrobiodiversity. Within the last 100 years, varieties may have either been lost altogether or assimilated into the seed stock of newly-formed villages. Thus, linguistic transitions were estimated to correlate with biological transitions of agricultural seed varieties.

San Pedro's flood was considered a significant historical event for the purposes of this study because it concerns one of the main research questions regarding how historical events have factored into changes in agrobiodiversity and seed conservation. Participants indicated that men and women's migration patterns following the flood resulted in their quick mobilization seeking habituation and land elsewhere because they lost their homes and possessions, which likely included their seed stock. Unfortunately, there were no records or exact certainty of this conjecture, and without baseline data on the seed stock existing in villages before and after significant migration events, it wasn't impossible to compare the genetic variation and changes of present-day maize in the Chinantla with that of pre-flood maize stock.

Comparing Access to the Highway between Santa Cruz and San Pedro

Highway access was one of the most commonly mentioned factors in descriptions of how traditional culinary knowledge (TCK), nutrition and eating patterns changed. A primary

[6] This estimate is based on field notes, interviews and observations of my encounters with women. Ironically, (Bevan 1938: 31) study on the Chinantla region shows similar "percentage of monolinguals" based on survey data from the 1930 Census across dozens of villages: Total Population 24,836; Monolinguals: 17,603; Percentage of Monolinguals: approximately 71%. Following the state-sponsored establishment of Spanish-language public schools, the colonial language took root among villagers, especially with boys who often achieved more years of schooling, and travel outside the village.

difference between the two communities was that Santa Cruz had access to an interstate highway and motor vehicles since approximately 2003, whereas San Pedro had no highway or vehicles and thus only foot and pack animal trails for transporting goods. In all household interviews, participants were asked to describe events or influences that have changed the way they eat or prepare food during their lifetimes. In the Santa Cruz workshop of 30 people, the dominant narrative blamed the highway construction for bringing bad eating habits, junk food and "food from outside" which they considered to be less healthy than "food from here". Whenever Santa Cruz men and women spoke of the past, they used the word "before" to reference "life before the highway", which signaled the beginning of a "nutrition transition" via the replacement of traditional farming tools, cooking appliances and the introduction of industrial foods. However, I suspect that it also brought about an increased political consciousness that accompanied the commodities, cheap goods and their attendant public health consequences during the period between the Coffee Crisis and the introduction of NAFTA. (I discuss this in more detail below.)

By contrast to Santa Cruz's negative highway influences, in San Pedro, people emphasized the urgent need for the construction of a road or highway, which, despite easing access to junk foods, they believed would pave the way for crucial health and education services. Although people from San Pedro initially referenced the disappearance of trout that coincided with the Miguel Aleman Cerro del Oro Dam construction completed in 1976, the discussion of a future highway was always discussed during interviews and in the focus group. Thus, one of the primary findings from this study is that the construction of a motorized highway could have the strongest influence on TCK and health in San Pedro.

Across both villages, men and women recognized that highway construction had its advantages and drawbacks. Overall, they would rather have the highway because the benefits for

health, food provisions and transportation of goods and people outweighed the predicted negative impacts on health, such as pollution and the introduction of "foods from outside".

The highway facilitated the introduction of industrial foods and goods, which initiated the transitions in traditional culinary knowledge, as they shifted to modern appliances and non-native foods. In Santa Cruz, for example, before the highway, one family recalled that their son purchased and transported a gas stove as a gift for them, which he delivered using pack animals along the foot trails that led to the village. Following the completion of the road, many families could purchase electric grain mills, refrigerators, freezers, gas stoves, blenders, chainsaws, woodworking tools for construction, cement blenders, telephones, televisions, radios, and other electric appliances[7]. Yet, these added benefits also introduced changed tastes and eating patterns, along with the polarization of food values between youth and older adults. As the CORENCHI President said, in Santa Cruz:

> . . . there is an advantage to having a road, right? Because it makes access for everyone easier. But it also allows for a lot of things like junk food, or we could call them genetically modified foods. That's when the value of the natural things we have gets lost because it's commercial. The youth today, they almost never want to eat wild greens. They act like it's weird. They also don't want to eat the beans.

In part, agrobiodiversity and TCK transitioned because a shift in values: prioritizing new "outside foods" - shuttled in on the highway - to those that grew wild and within families' own agroecosystems. Outside foods were introduced via the highway through community members purchasing foods while visiting cities, reselling products in their own communities and state-

[7] Computers, printers and other office supplies are not found in private homes, rather were only observed in public governance offices, public schools and the health center. Landline telephones are found in a few homes, and public governance offices. Santa Cruz has a single functioning internet connection at the middle school, but no one in San Pedro had any computers and there is no cell phone or internet service. It is expected that future highway construction will facilitate these services.

subsidized intervention programs, like commercial stores, and agriculture and nutrition assistance programs (to be discussed below). None of these programs would have had the ability to directly distribute materials without the highway, which was confirmed by visiting the two communities, one with a highway and the other without.

The construction of the highway in Santa Cruz allowed individuals to purchase and distribute goods on their own, through a cottage industry of reselling industrial manufactured dry goods and foods. Approximately ten men in Santa Cruz purchased vehicles following the highway's completion. Communal governance officers, including the President of the Commissioner's Office and the President of CORENCHI, have access to publicly owned vehicles for communal services. A 16-passenger van was the sole public transport with service to Santa Cruz. Prior to the road, people walked with pack mules, approximately 6-10 hours to the nearest market town of Ixtlan, which now is approximately 2.5 hours' drive. Additionally, the highway brought the establishment and staffing of the Health Center in Santa Cruz, with two part-time nurses daily, and a visiting doctor. The Health Center served as a clinic and a first-aid response location for emergencies, births, check-ups and provided a pharmacy. Thus, the highway facilitated industrial food commerce and developed a site for local medical treatment in Santa Cruz.

By contrast, in San Pedro, it was no coincidence that the absence of a health center was due to the failure of the municipal governance in San Felipe Usila to fund the completion of the highway. *Comuneros* and residents stated that highway construction was important primarily for accessing emerging medical services in San Felipe Usila, a sentiment reiterated by candidates for political office who campaigned in San Pedro during the research term. Dialogue from the CORENCHI focus group gave voice to the urgency of the matter. From the CORENCHI

delegates' perspectives, the negligence of the municipal governance in San Felipe Usila was dire and presented immediate needs because "there is no road and no medicine [. . .] right now to transport people, sick people, people who need to see the doctor in Tuxtepec, we carry them. The community has to work together to support them to Usila and they are really heavy." Long-term negative impacts of the highway - such as the introduction of "foods from outside" - were less important than the impending benefit offered by a Health Center, that San Pedro *comuneros* believed was crucial for their community members' health. While this perspective was understandable, it is likely that foods introduced from the highway will cause increased health problems. Furthermore, during the Focus Group with all male participants, the discussion wasn't able to address women's perspectives about the tradeoffs of the highway.

Gendered Division of Communication, Labor, Communal Governance and Landholdings

In both Santa Cruz and San Pedro, my findings indicated that the *exclusion* of women's opinions in public spaces allowed for men's dominant influence on labor, responsibilities in communal governance and landholdings. It seems that gendered roles have reduced, but not hindered altogether, the degree of women's control over agrobiodiversity, seed conservation and TCK. Women were rarely property owners, nor the principle recipients of PEHS, thus distancing their voices from communal governance decisions regarding conservation regulations, in addition to a wide range of issues spanning health, education and development infrastructure (such as the highway). Men were principally responsible for fieldwork, harvesting and pack-animals, while women worked in the fields as well as carrying the principal responsibilities for food preparation, child and elderly care, and housework. A grandmother summarized, "After having a baby, women don't usually farm daily. They may take kids to the field if they carry them in a cloth sling. [. . .] Women help in the fields, but most prefer to work at home." This

sentiment was echoed by most women, which suggests women's own devaluing of their efforts and contribution to fieldwork. Prior to conservation regulations which banned hunting and the disappearance of wild freshwater food (principally fish and shrimp) men were responsible for all hunting and fishing activities, which points to a shift in the division of labor that may have alleviated some of women's duties in the fields. Men generally spoke Spanish in public places more frequently than women, with the latter often concealing their Spanish language ability due to insecurity or social pressure, from Mexican *machismo*, that dismissed women's credibility as inferior to men.

Communication and Communal Governance Women's roles and their voices were more prominent in the home while performing food-related activities (such as cooking or tending to patio gardens) than in their vocalized participation in communal governance activities. Public governance spaces included the General Assembly hall, where communal decisions were made by consensus, and within CORENCHI, where negotiations concerning PEHS and environmental stewardship were managed. In Santa Cruz, *comuneras* were given communal responsibilities and tasks in CORENCHI – it wasn't clear if women were expected to work with the same productivity as the men, in order to receive the same privileges. In San Pedro, women participated less in the General Assembly, none were involved with CORENCHI and fewer women held communal responsibilities than in Santa Cruz where political activities were attended by a larger population and encompassed people from multiple neighboring communities.

A special example of encouraging more participation by women occurred when Santa Cruz hosted neighboring CORENCHI community representatives and visitors from Oaxaca City to attend the Fair for Biodiversity and Culture. In preparation for the fair, CORENCHI President

met with two women *comuneras* whose community titles were CORENCHI community technicians. He emphasized to them the importance to reach out to visitors and guests and display their training:

> It's important that when reps from CONAFOR, CONABIO and others come to the fair, any CORENCHI personnel can reply about the value of their knowledge of their forests, biodiversity and food sovereignty. We may be indigenous, but we have the capacity to be experts in our roles. I'm going to make sure I'm wearing our traditional clothes, long shirt and long pants, for the Fair because it shows our traditions. [The young women laughed at him, but he kept talking.] No, I'm serious. You ladies both previously said you'd be [community] technicians until you got married, then you'd be gone, but you're both carrying out your charge as *comuneras* and have important roles to play at the Fair.

Although there was encouragement by the CORENCHI President for these two women to participate and assume leadership in their roles, the women's laughter was revealing of a discomfort to take a stand and speak in public spaces, and belied their modesty or lack of motivation to assume the socializing duties asked of them by their supervisor. In both communities, field and forestry management decisions were dominated by men in public governance spaces, and seed conservation, cooking and health decisions occupied private, family spaces in households where women carried out the majority of work, but had equal say with men in decision making.

Women generally communicated much less frequently when men were present in General Assemblies, both in Santa Cruz and San Pedro. By contrast, women were much more vocal during meetings where they were the dominant majority. For example, I attended a PROSPERA meeting in both communities, which had less than 5 men and over 30 women each. PROSPERA is a national nutrition program that offers conditional cash transfers to women (or the primary caretaker in households with dependents), in exchange for meeting required criteria of attending nutrition education courses, feeding children and assuring their regular school attendance, and consuming nutritional supplements when pregnant. Whether women were

facilitating discussions or in the audience at PROSPERA meetings, they contributed to the dialogue more frequently, voluntarily and spoke louder than during other interactions where the majority of attendees present were men. (PROSPERA is discussed in more detail below.)

In household interviews, some women felt insecure and concealed their ability to speak Spanish, while others indicated they didn't want to. Women's hesitance to speak during interviews was clearly due to unfamiliarity or distrust of me as an outsider. During a daily visit to the river to wash clothes and bathe, a San Pedro woman said dryly, "I understand you, but I don't like to speak Spanish. It's not that I don't know how to speak, it's that I don't have to. This is my home." Women's social roles were as caretakers and workers in the home and the village, and their power and influence was exerted through their native language and maintenance of their responsibilities. It was in public spaces where women's voices and knowledges were quieted and/or infrequent: specifically evoking subservience to men's voices and a lack of credibility in women's opinions.

In public gatherings, although there were occasionally women who led events or discussion topics, I witnessed three occasions where women's silence indicated a declining agency over their embodied knowledge of agrobiodiversity and the performativity of TCK. First, in local government assemblies in both Santa Cruz and San Pedro were spaces that took on a dominant male tone, since few women in the audience voluntarily contributed their opinions or responses unless they were directly requested by name. This was evident during the Santa Cruz community workshop, where only two women voluntarily spoke, and in the San Pedro focus group where no women were considered eligible because they weren't delegates or technicians with CORENCHI.

Second, during the Mother's Day Festival in San Pedro, the local primary school teacher opened the event by introducing a panel of 5 of the community's "most respected and honorary men" seated on the shaded pavilion stage, while approximately sixty mothers and grandmothers huddled for shade underneath trees around the perimeter of the basketball court, surrounded by girls and boys of all ages. Why were there no women on the stage for Mother's Day? It seemed that a dramatic gender inequality divided the women and children in the audience from the knowledgeable men seated on a raised stage, who spoke in Spanish to offer thanks to the municipal government for the donation of funds to host the day's festivities and lunch. A series of games and contests were supposed to engage mothers to compete for prizes donated by the municipal government through the primary school. However, most women bashfully declined to participate, which placed additional onus on three or four of the younger, more outgoing women who played and won most of the prizes. Several grandmothers were publicly laughed at when they attempted to retrieve prizes. The elder women misunderstood the Spanish-narrated instructions, and approached the stage to take gifts but were turned away, since they were mistaken about their qualifications for the prizes. The overall tone was one of displacing, or practically dis-membering, women from their own roles as mothers during the Mothers Day festival, an observation that doesn't support the preservation of women's knowledge.

A third observation took place during the Fair for Biodiversity and Culture, where the Culinary Contest was led entirely by women, from four different CORENCHI communities including Santa Cruz and San Pedro. Women stated that there was very little advance organization and information about the logistics of the contest, demonstrating their exclusion from involvement in the organization of a component of the fair that was specifically aimed at highlighting local culinary knowledge and heritage. During the Fair's session to highlight the

contestants' traditionally cooked dishes, women declined to orally present the dishes they prepared, opting instead to have their menus read aloud by the male master of ceremonies. By contrast, men orally presented on abundant samples of agrobiodiversity from fields and forests during the Biodiversity Presentation, as well as described their images in the Photo Contest. These public encounters, coupled with household interviews where women spoke more openly, suggest that gendered communication customs restricted women's voices in public places. By restricting women's voices, it silenced their embodied memory as a crucial tool to passing on knowledge about TCK which facilitates women's connection with the land, their kin and the governance systems in public places.

By contrast, women's voices and passage of knowledge were more amplified and respected within the realm of the household and home patio gardens, including in the caretaking of animals and children. Ironically, even when it came to cooking duties, many men and women said that they equally shared cooking duties and knowledge, although these were primarily women's responsibilities. I never witnessed men preparing an entire meal, although I did observe them assisting on occasion with various cooking or washing tasks. The discrepancy between people's insistence that men shared cookies duties and what I observed can be explained by two possibilities. On one hand, an underlying *machismo*, or masculine power dominance created a condition where men receive credit for work their wives do because men are considered the heads of household, thus receiving credit to some extent in any domestic work. Meanwhile, women's work in the field was undervalued and depicted as "help" but not as an equitable burden of labor, or for another matter, as an equitable responsibility of knowledge bearing for future generations. On the other hand, men may help in the kitchen and patio gardens more than I witnessed during the research period because they were busy with seasonal fieldwork duties that

commanded their labor at that time, more so than at other times during the year. As stated by a grandmother in Santa Cruz, "My husband helps with the cooking when he comes home from the *milpa*," so he still receives credit for his labor contribution verbally by his wife. "We both cook." In another household interview, a man who had separated and lived independently of his children's mother said, "The woman oversees teaching our daughter. The men, we are in charge of teaching the boys how to weed, how to sharpen the machete to go to the fields. So we have different activities regarding that." This indicated that there wasn't solely a division of labor, but a gendered division of *spaces* where communicating knowledge was considered credible and heritable, with women more vocal in the home space than in public spaces, while men spoke and opined in the home equally but dominated in public spaces.

Landholdings and Labor Property ownership and inheritance was patrilineal, favoring the passage of land from father to son, and marriage was patrilocal, whereby married couples moved the wife to the husband's village[8]. A large proportion of young married women had moved to their husband's family home in San Pedro from a neighboring village in the region. Although most agricultural fields and forest landholdings were held in communal trusts, plots for households were titled specifically to men *comuneros*, plus their unnamed wife. In San Pedro, two women had recently been widowed, and gained sole title to the land that had previously been titled as belonging to their husband by his specific name, plus his unnamed "*senora*". Consistent with marriage customs in Mexico, women in the Chinantla did not take the married name of their husbands. They were listed only by association of their marriage and not their own legal name,

[8] In the case when a woman became widowed, her opportunity to inherit sole title of land will be determined by numerous factors. This point requires deeper examination than was conducted during the research period.

on property records. Communal land tenure was apportioned to families based on their household size and registry as *comuneros* or *ciudanos*, or citizens.

According to the CORENCHI President, PEHS were distributed to individuals, and so married couples received twice the amount as unmarried individuals. Cash payments were distributed by the CORENCHI President to the head of households, which as stated above, tended to be men. My findings indicate that men were the principle recipients of PEHS, based on their eligible, titled landholdings, and that they were entrusted to share their payments with their wives if they had one. In effect, women who were not married received 50% of the PEHS that married couples did[9]. The CORENCHI President substantiated this claim by sharing his personal story: he lived alone in his house after separating with his wife. She and their children lived with another man in Santa Cruz, and he delivered 50% of his PEHS cash to her. Only unmarried and widowed women received payments directly from CORENCHI, rendering married women dependent on their husbands to share cash with them.

In a cash-based exchange, this leaves a margin of mistrust and potential exploitation of women's entitlements. Additionally, men participated in PROCAMPO, a direct cash transfer program of the Department of Agriculture, based on their fieldwork duties. Despite women's contributions of labor to field duties, they didn't receive funds from PROCAMPO. Although women did receive funds from PROSPERA, it was expected that they fulfill all the conditions of

[9] I inquired with the President of CORNECHI about the system for PEHS as it varied by gender, however I did not investigate this point during household interviews with women to cross-reference it for accuracy due to my concern of research ethics. I felt it would have been an invasion of privacy to inquire about marital finances given the short period of time I spent with participants. I did discuss division of labor with women, but not their handling of money. I was told by my research advisers and by numerous participants in both communities that discussing money would breed distrust of me since I was an outsider and newcomer to the community.

those payments alone without assistance from their husbands. Thus, exclusion of women's direct entitlement to property distanced their voices from communal decisions regarding conservation regulations, reception of payments, and it contributed to an effect of decreased agrobiodiversity and transitioned TCK.

The gendered division of labor in both Santa Cruz and San Pedro followed similar patterns: women's work was generally relegated to the household zone and men's work was distantly located in the fields and forests. Although both men and women said they worked with their counterparts beyond these gendered duties, the division of labor was not strictly enforced. The work duties shared equally between men and women included collection of firewood, collection of *quelites*, wild and spontaneous greens, for the family and domesticated animals, sowing seeds and harvesting food. Nearly all men and teenage boys were responsible for the stages of shifting cultivation, but solely men managed felling brush in the fields, followed by communal work parties to conduct controlled burns. Men cared for and fed mules and horses for transporting cargo. With the decline of wild animal food sources, men's responsibilities shifted toward farming activities more exclusively, which could have impacted women's roles to centering more on the household activities.

Women were not as frequently involved in field activities as they were with activities closer to the home: seed conservation, tending the home patio garden and chickens (or on occasion, turkeys, pigs and dogs), food preparation, housework, childcare and other work in and around the home. Most women shared in certain aspects of work in the shifting cultivation cycles, mentioning that they sowed seeds, weeded or cleaned the fields of brush, and harvested. Men and women equally cut, collected and portaged firewood from the forest to their homes a

weekly labor, carrying 40-60 lb. bundles on their backs suspended from a load-bearing forehead strap called a *mecal*.

Prior to conservation regulations and the disappearance of wild freshwater food (fish and shrimp), men were responsible for all hunting and fishing activities. Although at the time of research, San Pedro women and children gathered minnows and small crabs in the Tlatepusco River to prepare in soups, and some Santa Cruz men and women collected frogs in the Tlacuache and Perfume Rivers, women in both communities recalled prior fishing and hunting activities as men's work that decreased following the disappearance of large, native trout from the rivers, due to the construction of the Miguel Alemán Cerro del Oro Dam in 1989. In numerous interviews, men and women recollected the disappearance of trout from the rivers, and the cessation of men's fishing practices. A collective memory of the trout was embodied in the now-lost dish called *Caldo de Piedra*, or Stone Soup, which was a dish traditionally prepared by men for his wife and children. The provision of this dish not only is a rare example of a departure from the traditional gender binary, but it also indicated a loss of TCK that was passed through men, rather than women (discussed further below).

Women's embodied memory was performed through their decision-making influence that dominated matters of the home, as they used their bodies and their inherited knowledge as the primary seed savers, breastfeeders, cooks and caregivers to family members and animals. In both Santa Cruz and San Pedro, there were a few unique households where men lived without any women, although I did not encounter a single woman household without men. Women nearly always lived with men and participated in preparing food for themselves and men, as it was their domestic work responsibility and their customary pride that fulfilled their sense of womanhood. In household interviews, men and women considered cooking traditional foods to be knowledge

and work that was *equally* held and performed by both genders, although this widely held statement contradicted my observations. Instead, I observed women performing the work of cooking, recounting information pertaining to nutrition and traditional dishes, purchasing and storing food, saving seed and citing their grandmothers and mothers as their teachers. The gendered division of labor was more apparent in my observations than it was in the majority of *responses* of both men and women (as discussed above in the sub-section Communication). A small minority of men and women in both Santa Cruz and San Pedro accredited women as the primary bearers of culinary knowledge, kitchen work and household labor. Despite the statements regarding the question of division of labor in regards to cooking food, in practice I observed that women were often primarily responsible for feeding the household and passing on TCK (For examples, see section below on TCK, and Appendix: Recipes). If kitchen and housework was recognized as requiring less effort than men's workload in the fields, it raised questions as to whether women's work was valued as much as men's, or if their work warranted equal pay or privileges. The undervaluing of women's embodied memory calls serious attention to the potential threats to declining agrobiodiversity because women need to value their work as seed savers, stewards of native varieties and bearers of culinary traditions if they are to be passed down to the next generation.

PROSPERA and Women's Nutrition Responsibilities

Most women in both Santa Cruz and San Pedro fulfilled the conditional duties required for receiving PROSPERA cash payments, a government program that offered cash transfers to women (or the primary caretaker in the home). PROSPERA is national agency credited with decreasing poverty and improving nutrition outcomes for rural women and families. The program bases conditional cash transfers (CCTs) on recipients' monitored completion of three

main duties: consistent school attendance for children, preventative health care for elderly, and nutrition support for mothers (Adato et al. 2011; Ramírez 2011). Federal administration of the program was created specifically to reduce the incidence of corruption and interception of middle-men, so payments were directly transferred from the federal pool to individuals (Adato et al. 2011).

In Santa Cruz, women received their payment at the village center, but in San Pedro, a woman indicated that she and the other *comuneras* had to, "walk to Usila once every 2 months to hand-in their PROSPERA forms." Routine achievement of the conditional duties could only be met with the appropriate infrastructure in place, which was not entirely possible in San Pedro, due to the absence of a health center. Recipients of the program met in the community assembly room instead, and due to the larger space that accommodated the 30 or so women (plus one man) who attended regular bi-weekly courses. Nutrition education was offered using a Spanish curriculum, taught by a male community leader who translated much of the lesson into the Chinanteco dialect of San Pedro. PROSPERA's programming demonstrated a disassociation and homogenization of national trends that weren't fit for the place-based knowledge of Chinanteco women, and that hampered a central tenet of food sovereignty: women's rights to control the food system free of corporate intervention.

I witnessed several occasions where PROSPERA's curriculum was incompatible with food sovereignty and affronted the embodied knowledge that women inherit and pass down to their children. In nutrition lessons for pregnant and lactating mothers, the curriculum highlighted the intake of processed powdered vitamin supplements to boost nutrient levels and for boosting energy between lactations (Adato et al. 2011). By telling women that their own breast milk is ineffective without the industrially-produced supplement, it devalues the knowledge of herbal

medicines used by women to enhance lactation, nursing women's health and their relationship with native medicines from the forest. There was at least one wild shrub and a wild orchid pointed out to me during trail hikes that were used by women to aid in lactation problems and increase milk production[10]. However, these medicinal plants were not recognized in the PROSPERA curriculum. Instead, the lessons promoted dietary patterns that adhered to conventional foods within a spectrum of increasingly globalized Mexican foodways, but lacked local adaptations to existing resources within the Chinantla context. For example, one nutrition lesson suggested foods exogenous to the community: canned sardines, boxed cowsmilk, carrots, and Italian-style wheat pasta. This sent the message to the matrons of the program that a condition to meet the recommended dietary guidelines and receive cash payments, they had to seek out and purchase foods beyond their own subsistence foodshed and TCK.

Despite these obvious contradictions, PROSPERA served as possible gateway to increased income and education for women who were otherwise alienated from these forms of social and financial capital. In light of women's labor being focused in households, food provision and purchasing, women said that PROSPERA payments were their largest source of income. They spent their cash almost entirely on food, with secondary purchases made for household sundries, like soap and clothing. PROSPERA also subsidized medicine and healthcare visits to the clinic in Santa Cruz, but San Pedro women had to travel to San Felipe Usila, or further, in order to utilize healthcare benefits. Women spoke of their learning experiences in PROSPERA with an inflection of pride because it was a form of adult education for which they were compensated financially. By contrast, men often labored outside the community for cash-

[10] There was also a wild plant that whose properties were used as a contraceptive for pregrancy.

based income, but rarely did they get paid *to learn*. The CORENCHI President suggested that PROSPERA could be a useful existing program to leverage teaching materials to promote a course and booklet on TCK. "So, it's very important - if you were to have a way to create that booklet to give to the schools and at the clinic, because sometimes the clinic offers discussions to the women in PROSPERA, the women who are in the program, so that they know how they can continue conserving, protecting, and consuming natural things. It's important."

Agrobiodiversity

According to participants in both case study sites, the major factors that have affected declining agrobiodiversity were reduced crop yields and increased replacement with food purchases of food, rather than planting or harvesting food (Figure 2). Reduced crop yields – particularly of maize and beans - were attributed to several influences:

1. climate change (unpredictable, seasonally abnormal excessive heat and rain),
2. changed food procurement strategies due to conservation zoning regulations,
3. pest/plant disease infestations, (which can also be related to climate change)
4. the perceived impact that future yields were declining,
5. and changes in seed supply

In response to these influences, some households were unsuccessful at growing beans, or lost interest and stopped altogether. Some households reduced the number of varieties of maize they grew, or had decreased yields and purchased maize from stores instead. DICONSA stores stocked state-subsidized, for-profit grocery items and seeds for consumption, including maize and beans. Although most farmers preferred the traditional and economic advantages of growing their own native foods, in Santa Cruz, DICONSA provided access to commercial seed in local stores, thus offering the optional convenience for those with cash to purchase food rather than

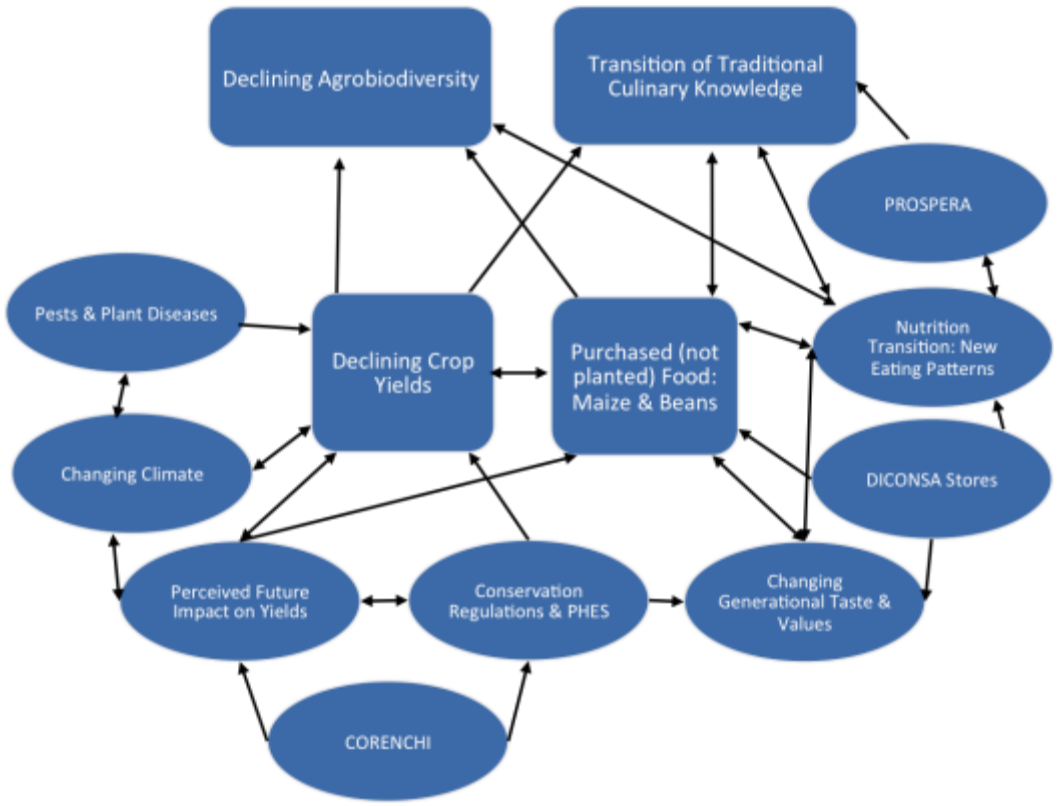

Figure 2. Conceptual framework of interrelated factors affecting declining agrobiodiversity and transitions in traditional culinary knowledge.

grow it. Though no such store exists in San Pedro proper, farmers purchased foods in San Felipe Usila, the market town to the north. Commercial food options have changed the youth and middle-aged generations tastes and values at home. New eating patterns have emerged during the lifetimes of community members, creating an overall trend of nutrition transition with social, ecological and public health consequences. These interrelated influences on major factors affecting agrobiodiversity are represented in the conceptual framework above (Figure 2). As previously noted, gendered differences persist throughout each of the elements in the framework.

Agrobiodiversity was declining because the overall spread and use of diverse cultivars was declining, however the Santa Cruz and San Pedro foodsheds may have facilitated the experimentation with new cultivars and varieties during the lifespan of the elder participants in both communities (for example, melons and jicama were both reported to have disappeared after

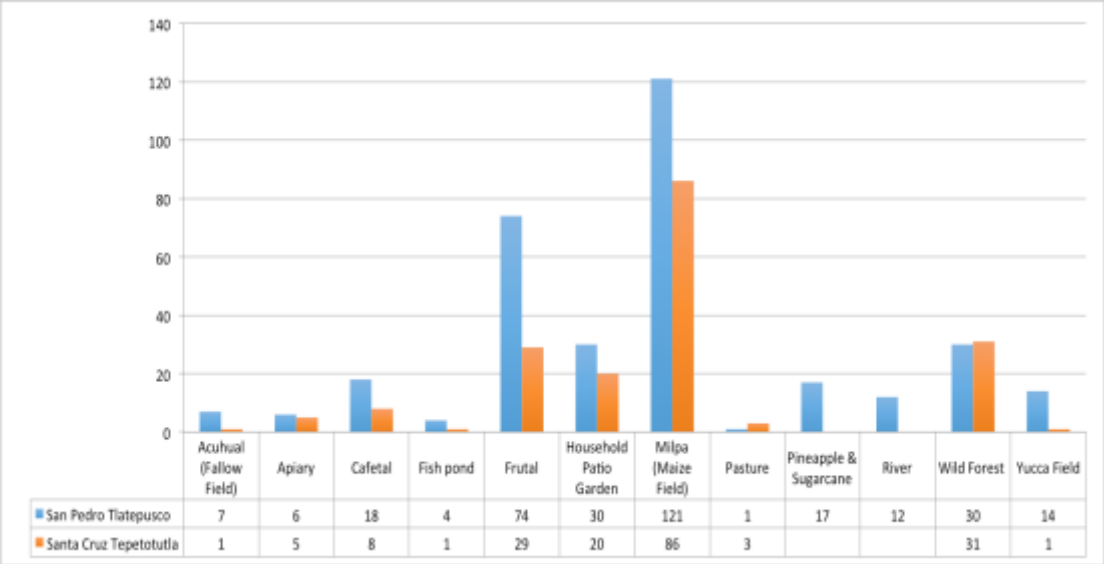

Figure 3. Agroecosystem Food Procurement Sites, number of mentions during semi-structured and unstructured interviews.

multiple varieties were tested). The foodshed, or collection of sites from which food is procured, consisted of three general areas: intercropped fields, stewarded wild food forests and freshwater riparian systems. Within these areas, I delineated 11 types of food procurements sites (Figure 3), including 1) the *milpa*, 2) yucca field, 3) mixed pineapple and sugar cane field, 4) *frutal*, or polyculture fruit orchards, 5) *cafetal*, or polyculture coffee sites, 6) wild managed and tended forests, 7) household patio gardens, including small greenhouses and animal enclosures, 8) apiary, 9) pasture, 10) *acahual* (fallow fields), 11) fish ponds, and 12) rivers.

CORENCHI delineated 3 types, (Figure 4) including 1) the *milpa*, 2) *cafetal*, or coffee polyculture sites, and 3) homes. Additionally, the forest and water systems coexisted as the foundation for all food procurement sites, and were regarded as the natural environment that nourished all living things in their everyday lives. The inseparability of food procurement sites from nature was fundamental to Chinantecos' worldview and stewardship of their territory.

As the number of food procurement sites has increased over the last 40-some years, the total area of arable land usage has decreased. The new sites to appear in recent decades include

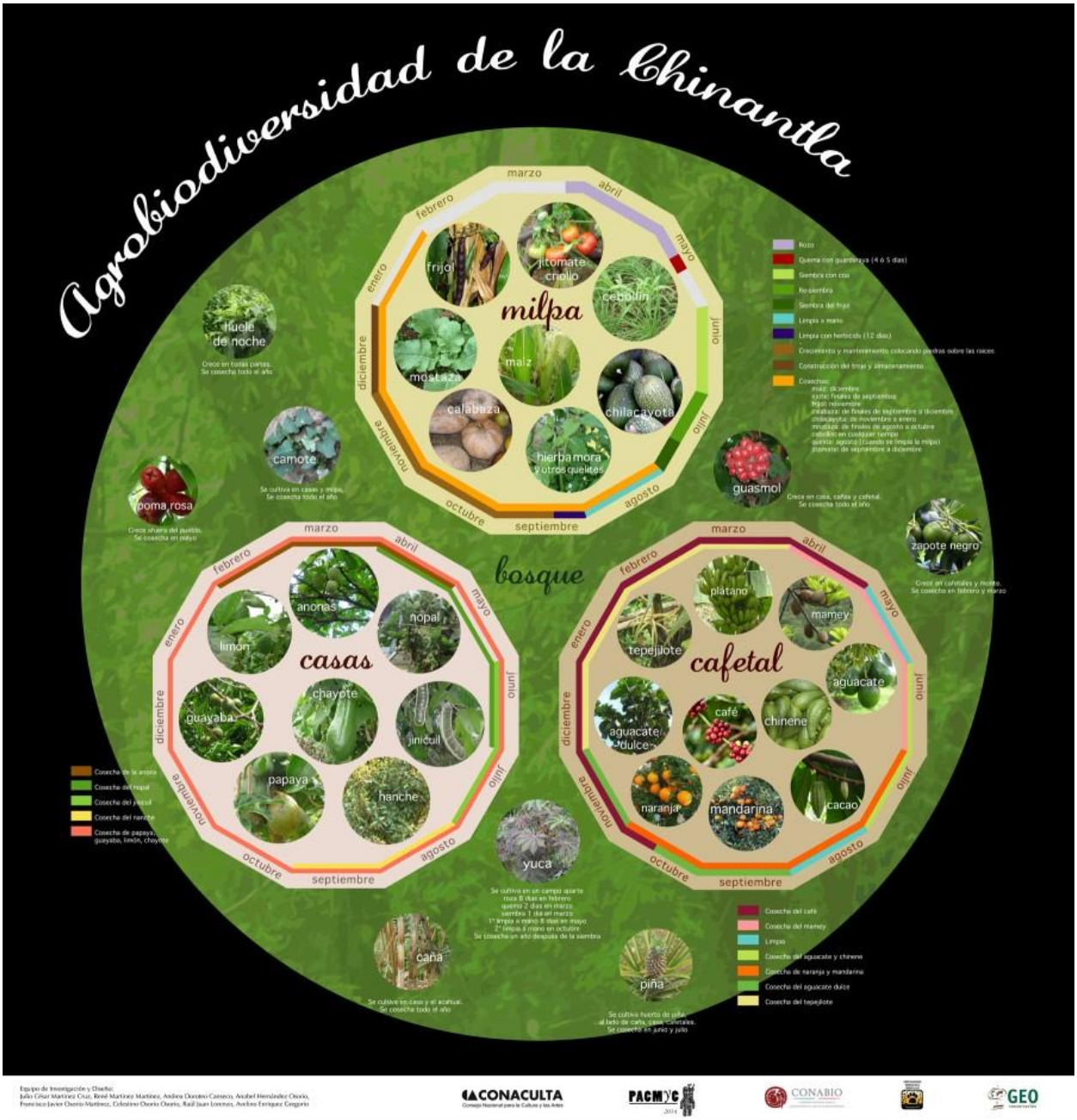

Figure 4. "Agrobiodiversity of the Chinantla" Poster, 2013. CONABIO, Geo Conservación and CORENCHI.

fish ponds (due to loss of wild trout), apiaries (introduced from development programs) and home patio gardens (see Photo 4). Although we must assume that home patio gardens have always been a food procurement site to some degree, many community members emphasized increased productivity and regimented practices in recent years from intensification close to the

home. For example, PEHS regulations required that animal husbandry always be practiced with confinements for fowl and swine, which has in many cases created increased productivity for heirloom hens' eggs and chicks, although swine production had reportedly decreased, according to household interviews in both Santa Cruz and San Pedro.

PEHS allowed for people to receive cash payments for every acre of titled land that they removed from active agricultural activity, though it was not entirely clear from the interviews how the conservation zone boundaries were determined and thus how to pattern or track the exact number of acres of former fields that were converted from shifting cultivation to conserved forest. In both Santa Cruz and San Pedro, payments averaged $300-400 MXN/ha per person, starting in 2004, regulated through contracts with CONAFOR (National Forestry Commission) mediated by Geo Conservación and an alliance between the CORENCHI communities, with the headquarters in Santa Cruz. In light of the payments, farmers' self-image as stewards of both their farmland and their forested land was bolstered and normalized, but with PEHS came the obligation to cease shifting cultivation activities in selected fields with locations within the conservation zone. Men spoke articulately about their role as stewards of the land during field visits to their farms and walking through communally-managed forests, but women did not express the same perspectives. The only woman present during any field visits in Santa Cruz was my local Research Assistant and Translator, a CORENCHI community technician. Other than her, the women who I interviewed and observed in participatory activities expressed their perspectives about agrobiodiversity, farming activities and food production through experiences in their households and home patio gardens, with less emphasis on farmland and forested land. When women expressed a self-image as stewards of agrobiodiversity in regards to farmland and forested land, it was primarily in reference to collecting medicinal herbs, *quelites* and coffee

harvest, with fewer mentions of regular, normalized stewardship of everyday labor in the fields and forest. These observations suggested that women have a lower level of participation with PEHS and conservation regulations; their interaction with PEHS appeared to be mediated through male family members' experiences. Santa Cruz's access to the highway further privileged their positive reception of PEHS through access to the regional economy and supported health and education infrastructure. San Pedro's absence of a highway rendered the PEHS more problematic for socio-economic benefits as well as agricultural outcomes. In the words of a CORENCHI delegate from San Pedro:

> "The people built the school on their own, as an example . . . And now that we have received support from CONAFOR, we are more lost than ever. We haven't even made a school. We who live there are bothered – not everyone, but there is a group of people who want the money to be handed out so they can spend it. As an example, the current commissioner, wants there to be a hand out – to split up the money given by CONAFOR. [Currently,] it's just for his benefit, because he wants to build his house, but we don't all think that way. What we want is a health center, schools, to change. Something for everyone. The people there only want to ask for money without having to work. They will send us money for the forest; that's what CONAFOR gives us."

PEHS enforced and rewarded the notion that the forest was a separate entity from traditional agroecosystems, without regard for much-needed social infrastructure, such as schools and a health center. In San Pedro, CORENCHI delegates said that the conservation regulations accompanying PEHS had severe consequences for crop rotation cycles upon which shifting cultivation agriculture relied.

Prior to the regulatory enactment of conservation zones in the forest, farmers cultivated *acahuales,* fallow fields that were rotated through traditional *milpa* sites, specifically located under forest canopy rather than in full sun because of their cooler temperatures and *tierra fria,* or cold soils, properties. In both *acahuales* and full sun exposure *milpas*, the crops included maize, field greens and herbs, and to a lesser extent, beans and squash employing a shifting cultivation

rotation system (Photo 4). Types of crops and their varieties have remained relatively consistent in *milpas*, with the exception of beans. Farmers said beans grew more successfully in *tierra fria*, or cold soils, typically found in *acahuales*, so the loss of bean agrobiodiversity, and their necessary crop yields, was linked to loss of proper soil conditions in plots that were converted into conservation zones. The issue of agrobiodiversity and seed conservation adaptation was discussed during the focus group with CORENCHI delegates:

> Some people have mentioned there is a loss of beans, that they don't grow as well as before. Right now, there is a regulation because PROAGRO[11] wants us to use other seeds. We have a regulation as a community to not accept those seeds and always have native seeds. [. . .] They're genetically modified seeds, modified corn. Because if you plant those, the native corn goes under and the only corn that grows is the corn they give us. Aside from that, they need liquids. Currently, all of the communities in Chinantla use native seeds. [. . .] There are like three types of beans, [. . .] but there is a type of bean that only grows in the *acahuales.* Like two hours from here in the *acahuales,* in moist, cool areas. It's the large *mayeso* bean [. . .] And right now, aside from a black bean that is eaten here [. . .] because they only have one season.

Hence, these agroforestry sites decreased over the lifespans of most participants, which decreased the productivity of beans, a consequence of PEHS that was cited by farmers in both Santa Cruz and San Pedro. In Santa Cruz, however, more families mentioned beans as a crop they were still growing in their *milpas*, but with smaller yields. In San Pedro, few farmers still grew beans, and ironically, many didn't lament abandoning the effort to try and make them grow in fields that didn't have the proper soil for them. They shared a positive hope and belief that by reducing farming activities in these sites, the soils and forest would rehabilitate back to temperate forestland. Decreasing bean production in fields led to decreased consumption and

[11] PROAGRO, previously known as PROCAMPO, was the Program for Agricultural Supply in Mexico, offered subsidized seeds to farmers, among other direct cash transfers to agrarian property owners (SAGARPA 2014).

integration of beans in traditional dishes, such as tamales or plantains and beans stew (see Appendix for recipes). It also reduced the nutritional values in caloric intake and complete protein when consumed as a compliment to maize. Furthermore, the transmission of seed conservation knowledge reduced in regards to how to select, sow, cultivate, harvest, store and replant native bean varieties *in situ*. Without the integral production of agrobiodiverse bean varieties, seed conservation diminished with negative results for the heritability of TCK.

Agroforestry sites produced fruit, coffee, wild greens and vanilla. Household patio gardens could include small, family-sized greenhouses that produced chilies, tomatoes and field greens, or household gardens containing tomatoes, chilies, herbs and transplanted native palms and other edible and medicinal plants from the forest. Apiaries produced honey, propolis and beeswax and were introduced around the early 2000's, as well as fishponds for raising mojarra, or bream fish. Additionally, farmers tended to wild endemic beehives for honey, although its collection was accompanied by taboos.[12]

Of all the food procurement sites, *cafetales*, or coffee agroforestry sites, were the most devastated by a plant disease called *la roya*, or coffee leaf rust, caused by a fungus called *Hemileia vastatrix*. Prior to the attack of coffee bushes in 1980s and '90s, farmers recalled selling 3-400 pounds of coffee fruit per week, at a price of $25 MXN/kg. Although a major price drop interfered with farmers' desire to sell in the late 1980's, many farmers' bushes were infected by the early 1990's resulting in a major drop in yields, about 10% of what they'd been

[12] During the fieldwork term, a Santa Cruz farmer was allegedly struck with paralysis after eating wild honey from an endemic beehive on his ranch. His two teenage sons portaged him back to the village because he was nearly unconscious. Rumors attributed his paralysis to eating wild honey from the hive, the day after a storm. It was a commonly held belief in Santa Cruz that lightening rendered wild honey toxic and indigestible following storms. By contrast, honey from European beehive boxes were not infected by lightning storms, whereas wild beehives were.

Photo 4: Agroecosystem spaces (clockwise from top left): Cafetal (Santa Cruz – SC), cattle pasture (San Pedro - SP); milpa field after grazing (SC); seed storage structure in fallow (SC); household patio garden and fish ponds (SC); Tlatepusco River (SP).

in highly productive years. Introduction of coffee plantation agriculture in southern Mexico in the 1980s was the most recent large-scale, collectivized, cash-based economy in rural Chinantla. Many agrarian men and women in some cases, entire communities, planted coffee on their

landholdings, integrating them into agroforestry cropping systems including timber tree canopies, fruit trees, wild plant medicines, mixed wild and cultivated vanilla orchids, and understory wild greens. Lack of funds to purchase new plants was mentioned as the most common reason that there was no great "rescue" of the coffee agroforestry industry. Individuals couldn't afford to purchase new, rust-resistant varieties at a scale that would recover the losses. Instead, community capital, organized by the communal government and funded by the state forestry agency CONAFOR, was the only way that new coffee seedlings could be purchased in San Antonio del Barrio. A delivery of 40,000 seedlings that arrived at the time of fieldwork allocated 500 seedlings per family, purported to be *la roya* resistant varieties. Most farmers were grateful for the seedlings, but they didn't know the specific name of the variety, nor trust the success of the seedlings before planting them.

In San Pedro, some farmers mentioned they'd received seedlings through a government-sponsored program called PROCAFE. Columbiana coffee variety was said to be resistant to *la roya*, but the green beans were inferior to earlier varieties whose harvests weighed twice as much before *la roya* infection wiped out their bushes. Most farmers were not convinced that the new seedlings would resist *la roya*, since prior attempts to reforest coffee agroforestry sites failed, but those who continued to grow Columbiana sold a small, marginal amount or withdrew from coffee sales altogether, and reserved coffee harvests for family consumption only. In either case, to witness the decimation of the coffee economy in their own fields, for many, had been a terrible omen for farmers, which precluded crop losses due to climate change.

Reduced crop yields and harvests of all varieties of maize and beans were attributed to climate change, limitations on land usage due to regulations and pest/plant diseases. All farmers conserved multiple plant-based foods in the form of seed and tubers in the household and

Photo 5. Three coffee varieties (Nuevo Mundo, Caturra and unnamed *criollo* variety) in a handmade basket woven of native forest vines. The woman carrying the basket commented, "there isn't much coffee on the bushes, but we give thanks to God for what there is."

managed agroforestry systems, consisting of an average of 3-5 varieties of any one food. Farmers said their seed stock levels were at lower quantity thresholds than were productive for maintaining adequate amounts for future generations of seed that displayed all the traits they wanted. When seed quantities reduce to such a low threshold, they harvested lower yields of pure-colored maize seed. In the case of beans, many but not all individuals stopped planting it altogether. Thus, farmers linked agrobiodiversity to their ability to save native and *criollo* seed, and directly objected to purchasing seed in order to preserve diversity because agrobiodiversity reflected their entire cosmovision and home. Several farmers attributed the declining agrobiodiversity to climate change, specifically in regards to maize production.

In order to describe how maize was affected by climate change, I must provide an orientation to maize in the Chinantla. Maize was consistently described and observed as the most abundant crop because it was the foundation of the *milpa* agroecosystem, the locus of heritable knowledge from the ancestors, and the foundation of dietary intake and culinary knowledge. The five maize varieties were always described by color, in order of most mentions: normal yellow, white, blue/black, strong yellow, and red. Additionally, I observed mixed-color maize cobs, referred to as *pinto*. Farmers don't consider pinto a conserved variety because it is not one pure color and is separated from seed for planting in the following year's sowing. Seeds from pinto maize cobs were either fed to animals or consumed in the household. Pinto maize seed was not planted in order to avoid the reproduction of multiple colored seed traits on one cob. Red and strong yellow maize only appeared in a very low supply in a few households, or absent altogether. Blue maize is the most frequently isolated color within a field planting because of its unique growing adaptations to the *tierra caliente*, or hot soil types, at higher elevations above the village. Blue maize matured quicker than white and yellow maize, a useful trait for staggered harvesting, and its culinary use was reserved exclusively for blue tortillas and *masa*, or corn flour dough. Blue maize could be mixed with other colors, but cooks preferred to mill purely blue kernels and omit other colors when preparing dough for aesthetic reasons. Although no one ever said that maize was the most *important* crop, the value of maize was emphasized repeatedly with multiple interviewees who said, "the more diversity of all crops, the better." Inherent in this regard of value for all crops was the fact that farmers grew for family consumption, not for commercial markets. The future success of native seed stock was dependent upon annual planting cycles, but these cycles had been threatened by a number of social and ecological factors, including climate change, precipitated in part by conservation regulations.

Comuneros in Santa Cruz and San Pedro had differing opinions on the affect that PEHS had on motivation to continue farming, particularly among the youth generation that would be responsible for farming in the next 10-20 years. A principal concern among parent-aged, male farmers was the lack of motivation of youth to exert effort and endurance in the fields, in the old ways like their parents had. Some argued that payments had decreased the youth's motivation to earn their own living by growing their own food. Others suggested that PEHS had not decreased youths' motivation from planting altogether, but that it had furthered the distance from home that youth needed to travel to arrive to their fields. According to CORENCHI President in Santa Cruz, the conversion of *acahaules* back to conserved forest canopy via conservation regulations had negatively impacted bean seed conservation due to crop losses, and this in turn had an impact on young people's motivation to farm:

> . . . before [PEHS regulations], people were [not] cutting old growth forests. – No. They were cutting the forest and growing in the forest where there were large trees, and the green beans grew really well there, the red and blue pole beans and the *mayeso* bean. The squash, and the field greens, there were a lot of them back when they used [the *acahuales*]. But, that isn't a motive either, because as we have a sustainable management plan, we have land order, we know where we can grow and where we can't. It's not a motive that can affect it, the only thing with the youth these days is that they don't want to go two or three hours away to plant, because we know very well now where the conservation area is, via *Fondos Concurrentes* [Concurrent Funds - a government program] and conservation areas with environmental services. We know very clearly where we have those determined zones, no? But there is enough space as well for planting. But it's like I say, the youth don't want to walk much . . . The elders, the old people would go and stay two or three days. They would camp and sleep in the field to be able to advance in planting on Monte Virgen . . . Now, no. Now the youth at 4:00pm run home because they want to be in their house. They don't think much about look towards the future. How to get natural, local food in the Chinantla.

By contrast, in the San Pedro focus group with CORENCHI delegates, community technicians conceded that the youth motivation to continue growing maize may be tainted by decreased agricultural land due to conservation and the warnings that climate change will hinder

maize productivity. They addressed the confluence of several factors that conjured doubt about the future of their foodways:

> I think that it will change because right now, way back before we got involved with conservation, there were a lot of ferns all around from here to the mountain it was all ferns. And now there are more trees. I think because they don't burn [during shifting cultivation activities]. They don't let the fire through. I think more trees will grow. It would be, the change would be that in ten years it will be a forest. But if we keep contaminating, if the businesses keep contaminating with chemicals [fumigation pesticides] I think that in thirty years we are screwed if it keeps going that way. Because according to the science, in fifty years the corn is only going to grow to here. [With his hand, he indicates a plant that grows to the height of his knee.] Really small, because there won't be any production.

Climate change was expected to decrease the productivity and the overall size of maize plants. CORENCHI delegates cited the Food Sovereignty Diploma course as their principle source for climate change information, and its projected consequences for *campesino* agriculture. Thus, conservation regulations as well as climate change were seen as primary factors for decreased crop yields as well as changing generational tastes and values (Figures 2 and 5).

An important distinction was made, however, between cultivars and wild food sources. When discussing the plight of decreasing agrobiodiversity, in terms of decreased yields and disappearing foods, farmers only mentioned agricultural cultivars. There was not mention of wild foods decreasing due to climate change, changing food patterns or pest/plant diseases. Men and women both spoke of wild foods as a gift that was especially unique to their forests, and wild foods were a coveted component of foodways, but also of the forests that hosted a complex and sacred way of life that was protected by the community. Wild foods and medicines were no more commercialized than cultivated species, and knowledge about them was shared only superficially because of a pervasive suspicion that outsiders could rob people of their wild plant resources if too much information about them was divulged. For this reason, discourses around wild food's roles and embeddedness in forest systems received much less attention during field walks and

interviews, although wild foods were noted in observations as having a tremendous value within agroecosystems and TCK.

Seed Conservation

Seed conservation referred to *in situ* post-harvest, annual crops whose seeds were reserved for cyclical sowing. Maize, beans, squash, *quelites* (spontaneous field greens), mustard greens, tomatoes, radishes and herbs produced seeds that were collected, selected, sometimes treated for preservation, and stored for 6-18 months. Farmers' references to pests infesting crops were considered a part of viable crop loss rather than a complication of seed conservation knowledge, because insects, bugs or plant diseases often attacked crops before harvest. An elderly man from Santa Cruz recalled:

> There have been varieties that have been attacked. We had good harvests of tomatoes, but they were attacked by ant nests which dried up the plants. Next came the mini praying mantises that attacked the *quelites*, *hierba mora,* and *huele de noche*. We had to put a pesticide around the plant just to save the seeds.

Once the crop was harvested and stored, it was referred to as seed, and then went through the process outlined below within the indigenous ecological knowledge framework of seed conservation, in the context of the Chinantla region.

For maize, seed selection for planting the following year was based on several visual and textural traits - the "best seed" was of uniform color, largest size grains and had neither pest damage nor pre-mature sprouting. To be of uniform color, seeds were described as "not having a black heart[13]." First, all harvested cobs were dried in seed storage structures in the fields called *almacientos* or *chozas*. Their ventilated thatch roofs and onsite location provided immediate

[13] "*Que no tiene su corazon negro*."

shade from the sun, while allowing moisture to evaporate for preserving the integrity of the firm, dry texture ideal for long-term maize storage. Properly dried maize lasted 14-16 months, although most was used with 10-12 months for sowing, culinary use or animal feed. *Almacientos* also facilitated a resting spot to reduce the labor of transporting large loads back to the community households all at once. Farmers retrieved portions of the harvest from *almacientos* over a period of several months following the harvest season. Then, farmers selected cobs that displayed approximately 75-85% or more uniform grain color. Pinto cobs that display multiple colors, with less than 75% uniformity, were stored separately in whole-cob form in vinyl sacks, until needed for culinary use or animal feed. Cobs with color uniformity were stored separately in vinyl sacs until shelling, which is the removal of grains of maize from the cob.

Regardless of family members' age or time spent doing fieldwork, women were solely responsible for degraining maize from the cobs. Occasionally, adult men, elder men and boys helped women with this task, though they didn't assume the responsibility for assuring its completion. As indicated by a man from Santa Cruz,

> They are the ones who take care of caring for and covering them. We come, we bring the things, we bring the cobs from the field, or the beans, and we leave it. The women take charge of caring for and storing them. Well, that is the custom, so that the mice don't eat it, so it doesn't go bad, so they don't develop holes. So, they are careful to conserve those seeds.

Women reproduced knowledge and practice for sorting seed into three separate stocks, in an ordered process: the best seed was conserved for planting, the next best for culinary use, and the lowest grade or damaged seed was used for animal feed. Women said that when selecting seed, they prioritized selecting traits advantageous for planting, and that culinary traits were less important. When selecting seed, a Santa Cruz man said,

> You have to choose the biggest seed, the biggest cob, and then you remove the kernels and get the seeds ready for planting. With beans, you just take

> off the pod and . . . if they have sprouts, you have to take those out, and you have find the ones with a nice eye because they have a little eye . . .

Terminal seeds located at the ends of the cob or bean pod were sorted out of the planting stock, because they were often smaller or pest damaged. Women's seed conservation knowledge was based upon their daily engagement with culinary preparation and responsibility for ensuring that the highest-grade seed was sorted for *in situ* planting. Nearly all women and men learned these skills from their parents and grandparents, but women were the primary actors responsible for the work.

Participants responded that *de facto* seed conservation had existed for hundreds, if not thousands of years, but that the introduction of genetically modified (GM) and transgenic seeds had compelled and affirmed community-wide *de jure* seed conservation at the household level. Men and women in both communities referred ambiguously to GM, transgenic and improved seed verities, considering them all to be non-native seeds that were bad for their physical health and poor adaptors to the local agroecosystem. In 2013, the community assembly in Santa Cruz agreed by consensus that all community members completely avoid planting non-native maize seeds, despite multiple attempts by state agricultural organizations to supply seeds, particularly maize. This agreement coincided with the attempted introduction of maize through the state-based program *Cruzada Contra el Hambre*, or Crusade Against Hunger, which offered the distribution of improved seeds to marginalized communities to address malnutrition. In Santa Cruz, several men said that GM maize was eaten but never planted, and the program didn't have staying power in the community. In San Pedro, CORENCHI delegates said that when farmers attempted to plant improved commercial seed from outside the community, "it didn't grow."

Several farmers also purchased maize from the DICONSA store[14] located on the community plaza, a government-subsidized provision store for marginalized rural populations. DICONSA maize was used solely for consumption in years of low crop yields due to excessive rain or pest attacks on the harvest. In the words of the President of CORENCHI:

> Sometimes, as much as we weed the area, sometimes the corn won't grow and that forces you to purchase corn at the CONASUPO [DICONSA - government-subsidized store]. That corn can't be planted, because that corn is grown with chemical fertilizer. The native corn from Santa Cruz doesn't require fertilizer or chemicals. It's all-natural. It has adapted to the earth. Adapted to the climate in Santa Cruz.

The hybrid maize sold in DICONSA stores contributed to community-wide resistance to depending on it for sowing seed, but has supported food security for culinary usage, which is mainly used for making tortillas and *atole*, a hot beverage made from corn dough. In a follow-up question posed to CORENCHI President, I asked if the DICONSA maize and bean seed was ever planted.

> It is hybrid corn – it can't be planted because it doesn't work out for the government that the maize they give us at CONASUPO [DICONSA] be planted because they would lose business. There wouldn't be maize sales. So, we are conserving native maize from Santa Cruz. The maize that comes with CONASUPO [DICONSA] can't be planted."

The claim that this maize couldn't be planted was to imply that it wouldn't resist disease and produce year after year, in the same way that native maize did. Furthermore, it indicated a deep-seated suspicion by the CORENCHI President that industrial maize was inculcated in part of a broader neoliberal project of dependence and extortion of *campesinos*. In 1999, DICONSA

[14] References to CONASUPO are synonymous with its current-day equivalent, DICONSA. A state-owned enterprise, DICONSA is an acronym for the System of Distributors of CONASUPO, S.A. de C.V.

replaced the Mexican National Company of Popular Subsistence, CONASUPO. As an agency of the government's Ministry of Social Development (SEDESOL), DICONSA's mission was to, "Contribute to strengthening the effective implementation of *social right to food* by facilitating physical or economic access to basic and complementary economic and quality products in an efficient and timely manner, in areas of high or very high marginalization (DICONSA 2016, italics added)." Yet, this statement is contradictory with DICONSA's *for-profit network of stores* which distributed, stocked and supplied food and household provisions in marginalized rural areas and communities with a population of 2,500 or less. DICONSA's mission to implement "the social right to food" contradicts their method of dispensing it through the sale of conventional seeds and foods that are sourced from outside the regional foodshed. In this way, DICONSA reproduces the juxtaposed problem between food security and food sovereignty (Patel 2012b): the presence of DICONSA stores in Santa Cruz worked against food sovereignty by replacing native maize with corporate, industrial surrogates, but provided a dependable, physical supply for food consumption when needed. In San Pedro, lack of highway access precluded the establishment of a DICONSA store, despite this state-run organization's mission to facilitate access to the most marginalized. Its provision of commercial "foods from outside" was expected to follow once the highway was completed. Thus, DICONSA stores were the cheapest resource for commercial seed, which farmers rejected, because they deemed maize from DICONSA a state-sponsored contradiction to local food sovereignty via the conservation of native seeds.

Farmers stated that non-native maize seeds introduced from outside the community would have effectively resulted in the displacement of native seeds for future generations, and they wanted to ensure their children would be able to carry on native *criollo* varieties. In

response to the question, "What do you do to secure native seed stock for future generations?" several farmers replied, "Plant it year after year. We must teach our children how to plant the native maize the way that our grandparents taught us.[15]" Indeed, this was a sentiment repeated throughout all interviews, with both men and women in both case study sites. To that, several younger men and women added, "we must prevent non-native seeds from being planted in the *milpa*." A woman in Santa Cruz also mentioned the importance of having cash to provide additional food security, which in her words, "have enough coffee harvested to have money to buy food if there was a bad [maize] harvest." In her perspective, successful seed conservation was tied to food security and maize yields. Across both case study sites, men and women predominantly said that to ensure agrobiodiverse seeds would be available for future generations, two crucial steps were necessary: sow seeds with the children every year *in situ* and refuse GM and foreign seeds from outside the community. By extension, these crucial steps for ensuring agrobiodiversity through seed conservation are identical for ensuring food sovereignty in indigenous communities.

In both Santa Cruz and San Pedro, this two-step requirement for successful seed conservation was potentially at odds with the future government's leadership and programming, who failed to promote traditional agriculture and native seeds, and promoted conventional agriculture and non-native seeds instead. The dominant, conventional agricultural paradigm was part of a promise offered by state-sponsored agriculture and nutrition programs, as well as political leaders. The PRI candidate for Municipal Mayor of San Felipe Usila said, "I will make sure every *comunero* will have the ability to purchase seeds, fumigation liquids and tools to

[15] Grandparents, *abuelos*, were interchangeably referred to as "those who had passed before," *antepasados.*

apply them." Political candidates' vision was completely out of touch with the determination of local farmers to avoid the use of technological packages and/or conventional farming tools rather than recognize and conserve traditional agriculture and native seeds that resisted reliance on industrial and corporate interference.

The divergence of politicians to present such technological solutions as agricultural packages rendered rural farmers' native seeds invisible and valueless. Rural farmers grew not solely for consumption but because of their knowledge of seeds' adaptability to their micro agroecosystem, such as red maize black bush beans and *mayeso* beans which were adapted to and grew most successfully in the cold soils of *acahaules*. Seed conservation in both Santa Cruz and San Pedro was impacted by non-native food interventions in the diet and market access through government subsidized commerce and direct cash transfer programs, which both profited corporate interests at the expense of TCK and food sovereignty. Additionally, farmers attributed their reduced stockages of maize and bean seeds to climate change and restrictive conservation regulations that limited their access to appropriate soil types in their own fields. Reduced seed varieties and reduced yearly yields resulted from these stressors, not from a lack of knowledge or understanding of how to select or store seeds. The suggestion by a political candidate that agricultural packages might resolve these problems completely overlooked the factors that affected agrobiodiversity and seed conservation. It also pointed to politicians' ignorance and disregard for the interconnectedness between agrobiodiversity, seed conservation and TCK, which was emblematic in the handmade tortillas of Santa Cruz and San Pedro. Such tortillas were not commonly found in the municipal capital at San Felipe Usila, presumably because of GM or non-native maize used in commercial and household tortilla production. "Beautiful handmade tortillas like this are rare nowadays," said a political candidate canvasser visiting San

Photo 6. Typical breakfast of maize tortillas, *quelites* and cilantro in broth, sliced radish and fresh-ground chili pepper salsa.

Pedro, who was gifted free lunch during a household interview with a local family. The displacement of native maize in hand-made tortillas indicated a direct relationship between seed conservation, TCK and food sovereignty.

Traditional Culinary Knowledge

Traditional culinary knowledge incorporated and relied upon the available foods within the agroecosystem, because the majority of food used in household cooking was harvested from a family's own fields. A typical meal incorporated harvests from a family's home patio gardens, fields and forests, spanning the range of food procurement sites so as to spread the benefit of labor across time and space in any given meal. TCK was passed from generation to generation through the lifelong praxis of women teaching their children and grandchildren - primarily girls – about how to gather and select foods, prepare them for cooking, and then how to present, serve or preserve food for convivial consumption in the family and community settings. Heritability of

culinary traditions was dependent upon the use value of native cultivated and wild-harvested, plant-based ingredients that were reported to have:

1. seasonally adequate yield quantities at harvest time,
2. healthiness of the ingredient for eaters, and
3. appropriateness to the local context of the Chinantla culinary traditions.

Tortilla production was women's daily labor - this work was integral to the pride and life force of the family's social cohesion because maize was considered a symbol of the strength and health of the Chinantla. Major shifts in TCK were attributed to a wide range of nutritional and dietary patterns: changed eating behaviors, diet-related diseases, particularly diabetes, changed taste and food preferences for those who adopted new foods. Participants frequently referenced native foods, or "food from here" as a remedy for diet-related diseases, and a return to the traditional diet in order to eat "clean" and "pure" food. The traditional diet avoided beef and pork except for special occasions, while preferring *criollo* chicken, wild fish or game as animal protein, and emphasized plant-based foods, especially *quelites*, or wild and spontaneous greens, vegetables, beans and maize-based breads and beverages.

The majority of households in both Santa Cruz and San Pedro depended on the woman head of the family to prepare maize tortillas once daily, along with an accompanying meal. In many cases, women made enough tortillas in one morning to last two days, if they had a refrigerator in the household. Refrigerated tortillas were re-heated on the *comal* before eaten. In San Pedro, women additionally made yucca tortillas and plantain tortillas, a specialty not found in Santa Cruz. Meals were eaten two or three times per day, depending on the workload and tasks. In cases where men lived alone, they prepared their own meals, but rarely did men prepare their own tortillas. Nearly all women prepared tortillas for their own households, with the

exception of the elderly who often received gifted tortillas from their kin. Commercial tortillas were not sold or available in markets, although occasional maize shortages drove some households to purchase maize for tortilla consumption, as previously mentioned. Men were less frequently involved in transmission of TCK, however single men who lived without a woman in the home said they had acquired some basic skills out of necessity, but ate several meals out of the home per week, or skipped meals. Preparation of maize tortillas relied on the process of boiling maize with slaked lime powder in water, a traditional cooking process called *nixtamal* (see Appendix for recipe) practiced throughout Mexico and Guatemala that softens the grains, helps loosen the skin and makes nutrients more bio-available. Of the men who participated in the study, only one prepared tortillas or *nixtamal* independently of a woman - a ninety-six year old man who lived alone in Santa Cruz. When asked, "what skills were necessary for traditional cooking," he replied simply, "*nixtamal."* He learned from his grandmother, and took on the responsibility after his wife passed away.

Not only was tortilla production tied to women's responsibility in the home, but it was also families' primary food source and the foundation of their nutrition. Women dominated in the kitchen, among other housework, and took pride in their titles as *amas de casa*, or housewives, rejecting *campesinas,* or the feminine for peasant farmers, which was more commonly adopted by rural indigenous women in other areas of Mexico. In both contexts of Santa Cruz and San Pedro, men and women equated TCK as inherently women's knowledge because of women's combined reign over matters of seed conservation, tending to home-based food procurement sites, working in the kitchen, and feeding with their family's own harvest, and assuring the passage of all knowledge to the next generation. The performativity of cooking combined with womens' knowledge renders TCK as a form of embodied, biocultural knowledge.

In these two communities, one exception to culinary gender roles arose in the case of bread bakers, who produced and sold *pan tradicional*, or traditional bread, from their homes. Both men and women baked *pan tradicional*, but the knowledge of baking was acquired by and passed down by men, primarily men who returned to their communities after migration outside the community, usually in Mexico City or the United States, where they learned baking skills in commercial production facilities. The *pan tradicional* recipe included refined white wheat flour, commercial yeast and water, sometimes adding refined white sugar and salt, producing a very lightweight, fine-crumb, risen bread, baked in an electric oven or a wood-burning oven. The consistency and regularity of breads in both communities could be linked with a professionalized knowledge, one whose goal was marketability. All the ingredients, except water (and firewood), were purchased from market towns outside both communities. Santa Cruz had two baker families who sold bread approximately once or twice a week, which varied depending on flour supplies. These families' *pan de casa*, house bread, was baked in large round loaves without adornment and eaten sliced, without toasting, sometimes spread with homemade conserves. San Pedro's baker was professionally trained in a production facility in California, and sold a wide variety of shaped, sweet and savory breads, as well as frosted, multi-leveled cakes for special celebrations. Bread was eaten as a snack with *cafe-té*, or coffee-tea, a hot coffee beverage hyphenated as "tea" to distinguish it from its highly-loaded counterpart coffee.[16] Bread wasn't an integral component of traditional dishes, rather it was eaten as a side dish or accompaniment. Although highly specialized, and despite the ambiguity of the word "traditional" inherent in bread, baking knowledge was differentiated from what I refer to as women's TCK because it a) relied on non-

[16] *Cafe-té* used one-tenth the amount of coffee to produce an equivalent sized cup of coffee, popular with urban consumers or in commercial coffee shops.

native, commercial-grade ingredients, b) depended on non-native techniques and traditions from outside the communities and Chinantla region altogether, and c) produced a finished product that was external to Chinanteco, core recipes and dishes that people considered to originate from their region.

Food from Here": Food Sovereignty in Context

Traditional foods were considered native to the Chinantla (cultivated landraces or wild) or *criollo*, cultivated heirloom, foods that were adapted into the traditional diet due to integration into local agroecosystems. San Pedro and Santa Cruz adults both highlighted that for health benefits, the most important foods were "foods from here", foods that they had on hand or that could be grown in their own environment. Essentially, though work and labor was respectfully acknowledged in order to produce "food from here," it was seen as being a free resource, because no money was needed to buy it. Thus "food from here" connoted food sovereignty from markets and non-native, improved or commercially produced foods.

Above all, "food from here" was considered key to good health, including landrace and *criollo* cultivars, wild plants and mushrooms, and both wild and *criollo* meat and fish. Green leafy vegetables, such as the leaves, vines and tendrils of the squash plant, and *quelites*, wild or spontaneous greens were mentioned as one of the most abundant and important native foods for health. In Santa Cruz, several people believed that curing and avoiding type-two diabetes depended on the elimination of refined sugar, soda and *pollo de afuera,* chicken from outside, coupled with the increased consumption of quelites. Chicken from outside was higher in fat, which was suspected to carry antibiotics and "chemicals" that caused cancer (though it was often mentioned in conjunction with type-two diabetes threats). There was approximately a half dozen

Photo 7. A typical wood-fired grill, and wood-fired *comal* with maize tortillas in a Santa Cruz household.

cases of cancer known in Santa Cruz where chicken from outside was eaten, but no cases of cancer in San Pedro where residents only ate *criollo* chicken they raised themselves. One man in Santa Cruz recounted that his brother, after migrating out of the community for work for several years, returned home with diabetes. His sister was the primary cook in the house, and she restricted his intake of sugars, served him *quelites* at every meal. Additionally, he drank bitter-

herb medicinal tea from a wild plant in the forest. His diet consisting of "food from here" was believed to cure him of all symptoms, which never returned due to his adherence and return to the traditional diet. Another woman in Santa Cruz said, "Now people eat meat from the city, *quesillo*, chorizo, sugar. The ancestors had white teeth and they died from old age, not illness like now." A 96-year old man from Santa Cruz attributed his good health to eating,

> . . . only quelites, hierba mora, squash, and I use a medicine for insomnia called 'mañ ño' that grows between the sugar canes. [. . .] The freeway brought us soap, soda, beer and diabetes. Before that, when I went to look for a drink, they had *posole* [a nixtamal-based beverage].

Similar studies in indigenous populations have confirmed consumption of native and traditional foods is highly correlated with positive health outcomes and decreased non-communicable diseases, which are more likely to be contracted from carbohydrate intake of non-native foods (Nabhan 2013). Fitting with this observation, among residents who had not migrated out of the community, there were no reported cases of diabetes of San Pedro, although some who migrated returned to the community after developing type-two diabetes from poor eating patterns in outside cities. The only San Pedro resident I encountered with diabetes emigrated for ten years, and returned with diabetes along with several other health issues. San Pedro's health representative said that the community indeed had a problem with soda consumption, and although diabetes cases were low, it was a top issue of concern: children and adults needed to decrease their soda consumption. These consequences for non-native food consumption began with health indicators, but were widely observed and linked to social-economic entanglements as well.

A San Pedro woman indicated these social-economic factors changed the way her family ate: when they ate more prepared foods, like instant noodles and coca cola, they grew and prepared less healthy food. "Food sovereignty is very important for our health," she said,

explaining that 20 years ago, people still made their own beverages with fresh pressed, wild fruit juices and homemade, unrefined sugar, *panela*, with cane juice mill-pressed from their own cane fields. Despite sugar cane's legacy as a non-native cash crop, introduced to the Chinantla as early as the 1600's (Bevan 1938), it was a relevant crop for contextualizing food sovereignty. Sugar cane was considered an heirloom crop because of its integration and adoption into local culinary traditions. Likewise, coffee and bananas were historically the most advantageous cash crops, introduced to the Chinantla region by international buyers, such as the *La Union Francesa* and United Fruit (Bevan 1938), but participants referred to these crops more frequently when discussing "important" crops due to a double qualification of value: monetary trade value on the one hand, and culinary taste values on the hand, which were vulnerable to replacement by commercial, processed foods from outside the community. Replacing local foods with "food from outside" was seen as a direct threat to food sovereignty. Above and beyond an abstract attachment to "native" foods, men and women experienced and witnessed how heirloom foods (both native and introduced) had become naturalized into the food system, creating self-sufficiency for families' consumption. Coffee and sugar cane were easily assimilated into local culinary traditions because of ease of the crop's maintenance and reproduction, and the length of time they had been integrated into agroecosystems. Food sovereignty was characterized by this female research participant quoted above as the willingness and the continuity of farmers to grow crops of their own choice, and to produce their own culinary goods and meals from those crops. She considered both native crops (e.g. maize) and heirloom crops (e.g. sugar cane and coffee) integral for food sovereignty, which was jeopardized when native and heirloom foods were replaced or substituted by commercialized alternatives from outside sources.

Foods from outside the community primarily included preserved or processed pantry foods, and vegetable produce to a lesser extent. When asked, "what foods and seeds were most frequently purchased or traded?" participants referred most frequently to vegetables (onions, garlic, tomatoes, jalapeño chilies), dairy products (cowsmilk traditional string cheese, cowsmilk white fresh cheese, boxed cows milk), meat (whole broiler chickens, chorizo sausage, trimmed beef portions), hens eggs and pantry supplies (white flour, refined sugar, vegetable oil, salt, dried spices, yeast, culinary lime) and "junk foods" (instant noodles, Coca Cola and other soft-drinks, single-serving snack chips, cookies and candy marketed to children). These products purchased from Oaxaca City or Ixtlan City (when in Santa Cruz) and San Felipe Usila or Tuxtepec (when in San Pedro) were sold in DICONSA stores and private households. Integration of some of the "foods from outside" was clearly integral for traditional diets: salt and slaked lime weren't naturally occurring in the Chinantla, so Chinantecos historically traded with other groups for these ingredients that were necessary for cooking and tortilla production. However, dairy and meat products received a mixed blessing: several Santa Cruz men and women said, "All the children want to eat these days is *quesillo* and *chorizo*." It's likely that men purchased and ate these foods more frequently than women, picked up in the urban environments while performing work outside the community and bringing the consumption habits back with them.

A consistent corollary of "food from here" entailed the adaptation of cooks to use, "whatever they had on hand," in their culinary skill set. Nearly all residents' favorite foods were associated with a sense of place, or a sense of home, in the Chinantla. Traditional dishes were important to them, and yet the ingredients they used had to balance with flexibility the conditions of seasonal availability and tradition. Cooking what they had on hand sometimes meant seeking out non-traditional foods – meats specifically – to celebrate holidays or parties. Oaxaca-city

based scientists Dr. Elvira Duran and Biologist Fernando Mondragon, both actively engaged in Chinantla research, said that dairy and cattle meat were not a part of the traditional Chinanteco diet. To the contrary, within the Chinantla, local men and women didn't consider meat from cattle as "outside food" if it was raised locally, rather it was considered *criollo*, or heirloom, naturalized to the local context.

A very good example of the meaning of *criollo* food was demonstrated during a local family celebration of the Santa Cruz Festival's 150th anniversary, by slaughtering a cow from their ranch and preparing a feast from it. The dish *Barbacoa de Res* or slow-cooked beef (Appendix for recipe), has not traditionally been a Chinanteco dish, rather, it's more common in central and northern Mexico where cattle livestock have more favorable conditions for grazing. This family had been grazing cattle on their high-altitude pasture for 18 years, and was the only family that sold their own pastured beef in the community. Early in the morning on May 2, the community's anniversary day, the family group took their traditional hike to their pasture. They led a ten-year-old cow back to the village, then slaughtered and butchered all morning at their home, which happened to be located right on the central community plaza. The family sold bags of mixed cuts of *criollo* meat for $80 Mexican Pesos per kilogram bag ($4.16 USD for a 2.2 kilo bag, according to the exchange rate at the time), on their home's front patio for members of the community, mostly women, to purchase. The meat was displayed on the banana leaves laid upon their front patio ground, emphasizing a common belief that Santa Cruz was a "*comunidad limpia*", "clean community", that there were no "loose dogs or farm animals" roaming the streets, and that the meat was fresh because it wasn't refrigerated. The 69-year-old woman, eldest of the household, recalled how every part of the animal was used, "We used to drink the blood fresh, but now they're not used to it . . . we eat the boiled blood now, full of iron. People

aren't as healthy as they were before [the highway was built]." The consumption of beef was a primary example of how creolized foods became symbolic of pan-Mexican culinary traditions, eaten for rare celebratory occasions although considered to be inappropriate or inaccessible for everyday consumption.

Many people in Santa Cruz mentioned that eating patterns and food ingredients changed in their lifetimes as access to popular culture in the city became more quotidian, people adapted foods and food traditions from the city (e.g. *quesillo and chorizo*), via market access that arrived with highway completion. In the Santa Cruz community workshop conducted by CORENCHI in conjunction with this research, there was a consensus among participants that culinary traditions and consumption of native foods were being jeopardized by the introduction of *chatarra*, junk food (candy, soda and bagged-snacks), *alimentos grasosos*, fatty and greasy foods (dairy cheese, prepared sausages and factory-farmed chicken) and improved varieties of subsidized maize and beans sold in DICONSA stores.

In the San Pedro focus group with CORENCHI delegates, although there was a consensus that eating patterns, newly adapted foods and food traditions had changed, men attributed the change more to conservation restrictions on hunting and loss of trout in the river from dam construction and climate change than from popular culture and food access in the market town at San Felipe Usila. San Pedro residents had to transport foods back to their town by foot or pack animal, so perhaps the inconvenience of food access rendered it less obvious because it was an external geography to the community's foodshed. Findings from this research suggest the possibility that Santa Cruz's residents ate "outside foods" more frequently or in larger portions than San Pedro residents due to ease of access to "outside foods" within locally operated stores.

However, not all "outside foods" were cast in a negative light, rather several ingredients were purchased because of their role in traditional Mexican dishes or their disappearance from agroecosystems. *Mole negro*, a savory black stewing sauce traditionally made with over twenty ingredients, including cacao and chilies, was not a native food to the Chinantla. It was made from ingredients exogenous to this region of Oaxaca, specifically the traditional black *chilhuacle* chilies (Trilling 1997). Still, black mole was introduced to the Chinantla sometime in the last century, for holidays such as Day of the Dead, Mother's Day or other large ceremonial gatherings, like weddings. It was a traditional *Oaxacan* dish among other indigenous groups, beloved for its rich earthy, sweet flavor, often stewed with wild pheasant from the high forests. People in the Chinantla, however, distinguished black mole as a Oaxacan dish, not specifically a Chinanteco dish, that was likely introduced first from small commercial markets in communities with highway access. Ironically, black mole also contains cacao which has been grown in the Chinantla for centuries, but was never indicated as an ingredient in locally-crafted mole.

By contrast, yellow mole fit prominently within a very traditional Chinanteco dish, mentioned in dozens of responses during interviews when people were asked what dishes they considered to be typical of the Chinanteco cuisine. Yellow mole in the Chinantla is a stewed sauce with a bright golden hue derived from ground yellow chilies. I attribute the differentiation between black mole and yellow mole preparations to the yellow chilies that men and women said had been grown in the region for generations, a variety they referred to interchangeably as chili *piquin* and chili *amarillo* (yellow chilies). At the time of fieldwork, the yellow no longer yielded to produce sufficient quantities for mole for most families, many indicating that they procured their chilies from stores instead of growing their own. In both communities, it was most common that people had to purchase either yellow chilies or prepared black mole concentrate to cook a

mole dish. Tracking back to the disappearance or reduction in yellow chili yields, participants were not clear as to why they didn't yield sufficiently to prepare mole. The ease of purchasing chilies and mole mixtures in markets rendered the disappearance of native chilies an unresolved issue that requires further investigation.

While industrial food consumption increased, it was also likely that bananas and plantains consumption increased because they were in constant surplus and were preferred over industrial foods because they were cheaper, healthier and a symbol of reciprocity. Bananas and plantains were both introduced varieties to the Americas[17], but have integrated into traditional foodways as *criollo* cultivars, and hold an important role for caloric intake, gifting customs as well as an ingredient in traditional dishes - both of which were observed to have great importance in Chinanteco food security *and* food sovereignty. As one local resident mentioned, "You won't die from a shortage of bananas,[18]" because they were in abundant surplus. Although many respondents discussed their personal and communal experiences of nutrition shifting towards increased consumption of "foods from outside", I observed and recorded frequent consumption and discussion about banana and plantains in the diet, both in main dishes and as a snack. Furthermore, men and women referred with pride to the number of varieties that grew in their patio gardens and along trails that connected *milpa* fields, cafetales, frutales and other food procurement sites where bananas and plantains were ubiquitously cultivated. Bananas and plaintains represent a possible exception to my findings that agrobiodiversity is declining because of the biocultural significance and abundance in the communities.

[17] Some estimate as early as 200 BCE.
[18] *"No vas morir de falta de platanos." Man from San Pedro*

Villagers gifted bananas to neighbors and visitors out of generosity and in the spirit of sharing, a very important custom in Chinanteco foodways. Any surplus food item available was considered for sharing, whether it was bananas or beef, on account of the value placed on using everything available, and not wasting food. However, bananas and plantains were an important supplement for calories when maize was scarce or "when we run out of maize, we make tortillas with manioc or plantains instead," as a San Pedro woman explained. They didn't require purchasing, in fact to the contrary, it would have been out of the question to purchase them. Still, no one *wanted* to eat plain bananas for a meal: they were considered a snack or a dessert food, especially because the majority of the varieties tasted very sweet. Seventeen varieties of bananas and plantains were mentioned in San Pedro, and 18 varieties were displayed at the Fair for Biodiversity and Culture in Santa Cruz, combining specimens donated from four CORENCHI communities. Women and men participants both praised bananas and plantains for their range of nutritional benefits. Both bananas and plantains contributed caloric and culturally symbolic value for gifting and reciprocity.

Bananas were not commonly incorporated into culinary preparations, whereas plantains were an important ingredient in savory dishes. The most popular and unique to Chinanteco cuisine in Santa Cruz were *albodingas* (Photo 8; Appendix for recipe), ground and hand-formed plantain dumplings cooked in black bean stew. The dumplings were rolled into a plum-sized ball, then indented with the thumb to form a small well where the bean stew pooled. A particular variety of plantain was used because it was more, "resistant, more solid[19]" in texture, thus was specifically selected among all other varieties for this dish. A comfort food mentioned several

[19] *"resistente, mas solido"*

Photo 8. *Albodingas*, or plantain dumplings, made by a woman in Santa Cruz.

times as a favorite recipe, *albodingas* were considered a traditional dish passed down from the ancestors, but less commonly eaten than in previous decades. Participants attributed the dish's attrition to a matter of convenience or tastes, but did not relate its less frequent appearance to crop loss, replacement from other foods, or changed eating behaviors. Rather, it seemed that younger women did not know how to prepare the dish because they hadn't learned it *yet*, but might as they age and learn additional culinary skills and traditional preparations. *Albodingas* were served to me three times and mentioned six times in Santa Cruz. However, in San Pedro they were *never* served, despite an abundance of plantains in households. Instead, a young woman prepared her favorite dish of Beans and Plantains (Appendix for recipe) consisting of fried plantains in black bean stew, which used all the same ingredients as *albodingas*, but lacked the preparation of dumplings. Beans and Plantains conveyed a completely different dish, along

with its associated knowledge and memories of the ancestors. The difference between these two recipes - Albodingas on one hand, and Beans and Plantains on the other hand - demonstrate a transition of TCK: Beans and Plantains appears as a modern dish that relinquishes the dumpling-making process, and discards the culinary use-value of the specific variety of plantain.

Wild foods were commonly incorporated into the diet, but their seasonality placed them in a special category: wild foods conjured happiness, excitement as a symbol of the season and pride in a sense of place. Wild plant foods such as *guasmol, tepejilote, achiote* and *cocolmeca* were not considered important for caloric intake per se, but rather were lauded for their flavor, the perception of micronutrients or vitamins, and their specific role within traditional, seasonal recipes and meals. Perhaps these foods were eaten in smaller quantities, either as flavorings, to add special textures, symbolic meanings or nutritional/medicinal qualities. It is not certain if wild foods were depended upon for caloric needs, but they definitely held a meaningful role in the matrix of foods that comprise TCK. For instance, considering that *guasmol* was frequently mentioned as a "very Chinanteco" food, the laborious process required for separating the seed from the pulp of this small red fruit was certainly observed as a labor of love, not of necessary caloric intake. *Tepejilote,* the buds of the native palm species, were collected for approximately 2 months of the year, and a favorite regional food in the Chinantla, because of its unique texture, flavor and abundance in months between maize harvests. *Achiote,* a tree seed used for coloring mole sauces, has no flavor, but conjured a sense of pride in women because "it's a native seed from here," said a woman from San Pedro, when discussing what her favorite foods were. *Cocolmeca,* a wild vine compared to asparagus, was whipped for its protein properties that produced foam atop the hot chocolate and maize beverage called *popo* (Appendix for recipe). Hot chocolate drinks are said to have originated in the Sierra Madre range that now spans

Photo 9. Popo beverage made by women in San Pedro, presented at the Fair for Biodiversity and Culture.

México, Guatemala and Honduras, but *cocolmeca* as a foaming ingredient for *popo* was unique to only a handful of communities. It was used in San Pedro, but women in Santa Cruz did not make Popo, it wasn't a part of their foodways. In contrast, Santa Cruz women made empanadas, maize pockets, with *cocolmeca*, although San Pedro women did not. Thus, dishes varied between the two communities, as well of the use of wild foods within dishes. The diversity of wild foods imbued an integral sense of place for residents of both communities, and though no wild plant foods were mentioned as being endangered of disappearing, wild animal and freshwater foods were frequently mentioned as endangered or lost, and related to place-specific recipes.

The most frequently mentioned "lost food" was *Caldo de Piedra*, or Stone Soup. Older men, more frequently than women, recalled the days when they would meet their families at the river following a day of fieldwork. Men fished for wild trout while women build a fire next to

the shore. A bowl, made from a halved "bowl" gourd, was filled with river water, fresh green onion, cilantro, a smashed chili and wild greens. A hot stone from the fire was placed into the gourd, bringing the water to an instantaneous sizzling boil. Freshly-caught trout was then added the bowl gourd, creating a delicious broth. The tradition of preparing stone soup relied on both men and women. Stone soup was eaten outside, like a picnic, and one of the only food traditions guided by men. Although people could still make the soup with farmed fish from their ponds, they said it wasn't the same the tradition and was abandoned to the past when the wild trout disappeared from the rivers. According to a young woman in San Pedro, "We don't eat stone soup, but to cook a fish, I prefer to boil it." This young woman spoke from her own experience: she didn't respond directly to the loss of fish in the rivers because she'd never had wild river fish in her community. She only knew about them, because elders reminisced about their experiences in their youth, a beautiful tradition that connected them with the river and nature, one they were sad their children couldn't enjoy.

Water is Life

People continuously mentioned water as their most important and valued resource, giving them all they needed to survive. It was also considered to be the most highly at-risk resource, more than local agrobiodiversity. Several participants referred to the dropping river levels had in the last ten years, erratic rain patterns with greater frequency of extreme storms characterized by heavier rainfalls in shorter peak periods. Both men and women regularly mentioned that the heat index had risen considerably in the last decade. These observations logically would have led to a higher frequency of evaporation and dryer soils during heat spells and wetter, eroding soils and landslides during peak rainfalls. There are no official data collection monitors in either of the communities where data was collected, rather the qualitative testimony of participants indicated

Photo 10. Tlacuache River in Santa Cruz.

climate change through higher peak rainfall events, higher temperatures and less-regular rainfall patterns. Furthermore, disappearance of trout from the rivers was a tragic loss for the foodways of both communities, and further emphasized that their village's location on the river was not impervious to downstream pollution and industrialization. The suspicion and fear that corporations or government would usurp usufruct of springs, creeks and river water led many community members toward fervent narratives.

Drinking pure water from the land was considered a major pride and health benefit, but when people come from the outside, they were skeptical to drink water because it was not common for water to be safe from contamination in Mexico. It was possible that outsiders created a stigma among local community residents that drinking plain water was contaminated. Water with flavoring in it -- whether artificial or locally-based fruit or honey - was commonplace

in Mexican cuisine, and drinking tap water not socially acceptable for outsiders. People almost never offered me plain water to drink. When I asked for it, I was nearly always offered fruit-water or artificially flavored water, Coca-Cola or coffee instead. If I requested plain water, it flowed into a conversation about the value I placed on their natural spring water (Photo 11), and what a rare luxury that was, where I came from. With this acknowledgement, many community members responded with appreciation and accolades of Chinantla water as the sweetest, cleanest, purest water. Public health agendas as promoted through the community clinic and government social service programs like PROSPERA encouraged all households to boil water before drinking it, even if it was spring-fed, because storage barrels could become infected or harbor bacteria. Some followed the suggestion, boiling their water in large batches before consuming it as drinking water, but many skipped this step. It was quite surprising to me to realize that people were aware of the threat to their water system, but still spoke of it so openly. As mentioned quite adamantly by a young man in San Pedro:

> The rivers to us are life. They are everything. They are life water. These streams, they are life. Like they say, when there are meetings, we say 'we can't live without water.' We don't want them to dry. There are a lot of people who are afraid that the river is going to dry because it is really low. "

Compared with the past threats to water and impending concerns, people were much more guarded in discussing the ingredients or process for food procurement, preparation of meals and ingredients, and especially guarded about the process of wild medicinal plant procurement, preparation of remedies and identification of medicinal plants. However, when it came to the issue of water, nearly all respondents described water with pride for its purity, abundance and tremendously high value in all aspects of life.

Photo 11. Natural spring along a foot trail in Santa Cruz offered pure drinking water to anyone who passed.

There was widespread resistance to past hydroelectric energy projects and the construction of dams, past and present. San Pedro *comuneros* opposed the future prospect of a new dam construction on the Tlatepusco River, just north of the neighboring community of Santiago Tlatepusco. They stood in solidarity with their neighbors in the firm position that water should not be monetized in their community or beyond, because all the waters were connected.

> "[. . .] the only thing that has affected us – in my opinion – is with the trout that were in the river because of the dam. That was food for the people here, it was the best food we used to consume but because of the dam they built, the Miguel Aleman Dam, the river died. [. . .] That hurt us a lot because there used to be a lot

> of fish here in the river. [. . .] There were like three kinds of fish and four types of shrimp.

The potential threat of monetizing water through hydroelectric development threatened the very fabric of the communities' survival. As indicated by men and women in both communities, climate change and hydroelectric development threatened water resources which had already reared negative consequences for agrobiodiversity, seed conservation, wild fish and traditional culinary practices. Thus, food sovereignty was undeniably linked to a broader, complex relationship with control over water resources because "water is life" and as soon the rivers were contaminated, the communities' foundational protein source – wild trout – disappeared.

Limitations of the Study

The two-month fieldwork term limited for the research topic in regards to seasonality of foods. Men and women spoke in less detail about crops and wild foods that were out of season, because they weren't a part of their present-day activities, harvests or cooking during the interview period. Had it been the season to harvest *chinene* for example, data collection would have revealed more detailed information on respondents' harvesting, seed saving and cooking knowledge on this unique fruit that is endemic to the region (Bost 2013). I arrived a few weeks before the beginning of *chinene* season, so only those respondents with whom I conducted field-walk interviews mentioned it, when it appeared in the trail.

Ideally, a full year would have facilitated a data collection of botanical varieties and species names, alongside their Chinanteco name, as well as variations on recipes. Although the purpose of this sociological study was to understand the historical influences on transitions in TCK, tracking the number of incidences and botanically differentiating species was undertaken

through observation and participants' testimony, rather than using botanical identification methods (see Appendix for List of Cultivars and Varieties).

I presented my research proposal to invite participation of a third community, Santiago Tlatepusco. I chose this community because they previously participated in CORENCHI, but withdrew in 2013. The Commissioner President of Santiago Tlatepusco informed me that their community assembly voted to cease all further participation in scholarly, governmental and NGO research projects. It would have been helpful to understand the perspectives of this community due to their differing socio-political views. Thus, one of the limitations of this study is that it only included perspectives of member communities of CORENCHI.

Previously conducted research in the area created a reticence to participate by residents in both Santa Cruz and San Pedro. In Santa Cruz, cookbook author Diane Kennedy conducted a traditional cooking workshop in approximately 2007-08, with the intention of researching recipes by native Oaxacan cooks. Her internationally-selling book Oaxaca al Gusto: an Infinite Gastronomy (Kennedy 2010) was a vast archive of indigenous foodways throughout the state. Without any follow-up as to why, Kennedy omitted the community's recipes from the publication, causing many women to feel robbed of their culinary knowledge, without receiving credit for it in the book. Several women mentioned this as the reason why they refrained from sharing details about specific recipes or cooking with me. In this case, confidentiality didn't help; women's trust in researchers had already been tarnished. In San Pedro, researchers have conducted studies about fauna biodiversity, including animals and butterflies, from the National University of Mexico, Oaxaca. Following the initiation of CORENCHI, the Global Diversity Foundation had a presence for several years, studying indigenous and community conserved areas and their impact on community residents. Researchers often paid with cash for food,

portage and guide services, through an official transaction mediated by the Commissioner President since very little commercial development exists in San Pedro. Cash flows from researchers resulted in what many community members considered unfair distribution of income for those who were contracted. Those who worked with researchers are most commonly appointed *comuneros* whose title was tourist host, forest guide or a woman who was asked to regularly provide food for guests in her family's private home. Consequently, the reticence to work with outsider researchers required that I negotiate through specific trust and community compliance issues in both case study sites.

My inability to communicate in Chinanteco likely enhanced all of the limitations listed above. All fieldwork communication was conducted in Spanish, which was spoken as a second language in both communities, especially for women who generally had fewer years of schooling than men (up to middle-school), and all participants over the age of 60, for whom no public education options were established when they were of elementary school age. My presence as white woman, speaking or writing notes in university-level Spanish, further limited me from reaching some participants who declined to take part due to language barriers. They may have felt an uncomfortable hierarchy due to my social position and relative privilege, but most simply said they didn't want to take part because they "didn't want to say the wrong thing.[20]"

Lastly, due to logistical limitations and a limited fieldwork period I was not able to collect data on the effect that migration played at the household, farm and community level. I expect that migration factors will significantly affect the preservation of agrobiodiversity and food sovereignty for indigenous communities in the state of Oaxaca. Further research is needed

[20] "*No quiero decir algo que no es corecto."*

to better understand gendered division of labor and migration patterns in Mexican peasant society in their sending communities, specifically considering socio-economic and historical shifts in the last several decades that have changed their everyday lives at home.

Discussion

Lost in Transition: TCK as an Indicator of Food Sovereignty

One of the objectives of this study was to understand the present-day and historical factors thought to be meaningful by men and women that affected changes in TCK. Eating was meaningful to all participants, but TCK differed by gender and was taught, inherited and practiced principally by women. The case study demonstrates that agrobiodiversity is declining and indigenous communities are challenged by external attempts to rescue it, resulting in nutritional transitions and indigenous-led political organizations to safeguard their natural resources and mediate state-based market mechanisms. People have consumed maize and beans (in the form of food) from outside the community when they experienced crop losses, but industrial maize and beans in the form of seeds have generally been rejected for planting purposes, based on a preference for seed sovereignty of native and *criollo* seeds. Consequently, food sovereignty has been sacrificed, resulting in a trade-off at the expense of public health. Research participants stated that income from state-based cash transfer programs was both a hindrance and a benefit for the community goals of improving health and conserving agrobiodiversity and TCK. In this way, the study has shown that food sovereignty in the Chinantla hinges not just on food and seeds, but also on culinary traditions, practices and transitioning food preferences. The research showed that the capacity of the community-based political organizations is limited by its alienation of women's voices, and the integration of TCK into programming. Prioritizing women's knowledge of seed conservation, traditional recipes and the value of "food from here" (including cultivated and wild ingredients) will be a critical intervention for improving outcomes of state-based support programs like DICONSA stores and PROSPERA.

It is crucial that research scientists who address genetic erosion in indigenous communities analyze food crops as genetic resources and tangible material while considering foods' biocultural value, impacts on public health and the geo-political influences on intangible traditional knowledge. Nabhan reviewed the growing field of research in gastro-genetics (Nabhan 2013) which has shown that indigenous populations' increased non-communicable diseases can be tracked directly to affected gene chromosomes by foods from outside the geographic origin of the human genetic pool that have been introduced into foodways, for cultural, political or economic reasons. Two of the disorders and mal-adaptations of particular concern to indigenous people in the Americas are listed as (Nabhan 2013:13-14):

- insulin resistance and type 2 diabetes resulting from fast-release, fiber-depleted foods, such as sugary soft drinks
- disaccharide intolerance resulting from milk, sucrose and maltose in high concentrations/quantities.

In the Chinantla, as in other areas with indigenous communities in Oaxaca, these disorders correlate with this research's findings on increased consumption of soft drinks, dairy products and "junk foods", further supporting the food sovereignty argument that native food traditions matter. "Evolutionary processes mediated by food choices have likely played important roles in generating both human genetic diversity and orally transmitted cultural diversity (Nabhan 2013:4). By reclaiming TCK, communities empower themselves to maintain healthy diets, conserve their culturally-valued native foods from contamination within fields and protect their bodies from illness.

Traditional culinary knowledge, which I argue is a major tenet of food sovereignty has not received enough attention at the communal governance level nor in state-sponsored policies,

programs, or commercial arrangements. The conservation of forests and water resources by states and indigenous-led organizations focused on agricultural and forest production as generative of physical material, measureable and calculable for market-valuation to negotiate monetized exchange for PEHS. State-based actors like CONAFOR and the civil association Geo Conservación have recognized the need to include culture within conservation programing, as was indicated by the Fair for Biodiversity and Culture, but traditional knowledge hasn't been so easily integrated into conservation regulations. Instead, restrictions on farming in *acahuales* have limited production and contributed to crop loss, which lead to reduced food sovereignty and increased dependency on purchased foods from outside the community. These transitions threaten the food sovereignty of the Chinantecos and are linked causes of declining agrobiodiversity, increased disease and threaten the heritability of TCK.

Preservation of agrobiodiversity, *in situ* seed conservation and protection of women's rights and knowledges are all central components of TCK. Tortillas made from native maize, the beverage *popo* made from maize, cacao and *cocalmeca*, and memories of the now-disappeared trout in *Caldo de Piedra* soup demonstrated an integral synergy of agrobiodiversity and seed conservation within TCK as it relates to "food from here". Culinary preparations, cooking skills, food selection by cooks, unique flavors and textures and food combinations may all be *archived* and *documented*, but the qualities most saliently representing TCK are embedded in the local values, meanings, relevance and social relationships that are forged by the *repertoire* of foods in everyday life at home and ritual celebrations, in the Chinantla. This local contextualization of embodied knowledge was itself the culture and the politics of place: it animated the governance and protection of the knowledge and the environmental place, and was not separate or detachable from women's embodied experiences (Harcourt and Escobar 2005). The interconnectivity and

the reflection of place and knowledge is a central tenant of TCK, and food sovereignty. The embodied knowledge of traditional cuisine and the agrobiodiversity of wild and cultivated foods from the Chinantla co-exists exactly within the Chinantla, are embedded in and informed by the history and politics of this contextual place. The wide range of banana and plantain recipes exemplify the performative repertoires (Taylor 2003) that women have adapted to the current availability of foods, which addresses the cultural values, meanings and skills as performed through traditional cooking and food preparation inherent in traditional food systems but which, in my research of TCK, recognizes the complexity of artistry and craft in cuisine. Mexican cuisines are not simply seen as a single stereotype of "Mexican food" as its often attributed outside of Mexico. Rather, within Mexico, regional cuisines perform cultural cohesion between regions, and embody heritable knowledge within communities, families and generations (Adapon 2008, UNESCO 2010), passed through women's work.

The politics of place framework applies to a recent study conducted in the Chinantla region by Ibarra et al. (2011), which demonstrated that food sovereignty and place-based knowledge was threatened by conservation policies and market-based mechanisms of PEHS. Ibarra et al. examine the negative effects that hunting restrictions had on eliminating heritable hunting knowledge across generations of men, who were primarily responsible for procuring food through hunting wild game. The introduction of formal and market-based mechanisms for conservation through PEHS caused a nutrition transition towards increased quantities of "outside foods" and processed foods, leading to decreased food sovereignty in the neighboring community of Santiago Tlatepusco (Ibarra et al. 2011). Santiago Tlatepusco residents previously collaborated in the 6 communities that comprise CORENCHI, but voluntarily withdrew from the organization, effectively surrendering inclusion in the CONAFOR program for receiving PEHS.

I cannot substantiate their reasoning for withdrawing from CORENCHI, however it is likely that their independence will be a step toward achieving food sovereignty because they will not be hampered by the regulations imposed by PEHS. Nonetheless, the community of Santiago Tlatepusco is located adjacent to San Pedro, and I estimate that they will still be faced with the influx of outside foods through DICONSA and other stores, PROSPERA nutrition guidelines, and other factors that contribute to the decline of agrobiodiversity (Figure 2). My research findings corroborate with those of Ibarra et. al (2011) to suggest the need for a baseline study in the Chinantla using ethnobotanical methods – which apply mixed quantitative and qualitative methods - to index the current state of agrobiodiversity so as to document how it changes over time.

Many studies have used quantitative analyses to depict agrobiodiversity in smallholder farms in Oaxaca, by evaluating the confluence of formal and informal seed systems, whereby farmers' willingly plant landraces, *criollo* and improved commercial varieties of maize in their fields (Bellon 1996; Bellon et al. 2003; Heerwaarden et al. 2009). These studies' inconclusive results suggest that the research community may better understand and analyze the human causes of genetic erosion using mixed qualitative-quantitative methods that seek to address how traditional agroecosystems and knowledges change across time, space and cultural context. Despite variations between named seed varieties at the morphologic and molecular level, defining agrobiodiversity in indigenous smallholder communities required a more complex understanding of farmers' own needs and uses, described in their own words. To their credit, these investigations of smallholder seed systems revealed farmers' seed lots contain fewer genetically distinct landrace varieties than farmers may have realized, which was attributed to gene flow in fields and market integration of *criollo* and commercial seeds. However, genetic

research methods have not accounted for the reasons described by farmers themselves for what they consider valuable about seeds' traits and uses. Furthermore, seed studies of maize haven't account for the heterogeneity in indigenous agroecosystems, which are constructed on a principled design of intercropped polycultures.

In the Chinantla, farmers may have been unaware that varieties that they thought to be pure landraces may have contained genetic information of *criollo* varieties, commercially-bred hybrids or even GM varieties. Farmers in these case studies *de facto* resisted the integration of formal seed systems, because they believed that seeds from outside the community - namely GM maize varieties - would cause the loss of informal seed systems, i.e. they would lose native landrace varieties. The Crusade Against Hunger, introduced between 2013 and 2014 launched in the communities, in which technological packages were proposed for the planting of improved maize, included synthetic fertilizers that farmers wanted to avoid due to perceived toxicity for themselves and the earth. These beliefs were key for understanding how *in situ* seed conservation influences TCK, but also for creating *de jure* policy that legally bans GMO seed through place-based politics, both archived and performed through a repertoire of resistance. In *Seeds of Resistance, Seeds of Hope*, authors Nazarea, Rhoades and Andrews-Swann (2013:6) eloquently describe "seeds of resistance" as existing

> [. . .] because of the powerful will and sustained action on the part of disenfranchised populations to retrieve 'lost seeds' and reintegrate them into their agriculture. By the same token, repatriation validates local sovereignty and triggers the revival of culinary traditions, patterns of social exchange, and property regimes that have long been forgotten or lain dormant.

Thus, the contextualization of indigenous resistance in the Chinantla opposed the introduction of non-native varieties, the delivery and sale of improved and GMO species, which lay claims to food sovereignty with the leadership of CORENCHI, whose political goal is protection of the natural resources of the Chinantla region.

Although much less has been studied about the loss of wild edible plants, and it wasn't the sole focus of this research, the findings suggest that it is important that community members protect wild edible plants because they serve an important cultural and social role (Turner et al. 2011; Tuxill and Nabhan 2001) in Chinanteco agroecosystems and women's TCK, thus paving the way toward food sovereignty. In a unique study of native medicinal and edible wild plants in the Chinantla, Chinanteco scholar García Hernández indicates that in many Chinanteco communities, a wild plant is considered "a living being that feels, listens and sees things" (2010:25), deserved of respect because of health-giving benefits through food and medicine, as well as magic-religious properties associated with plants used in the church. For example, myrtle branches act as a link with the sacred beings which are considered an "intercom with the Supreme Being" and have been marketed and sold within and beyond the communities. "Price is just a bonus for people who have to walk almost a day to fill one or two *tenates* [woven baskets]." (García Hernández 2010:25) Another singular study focused on wild plant species of the Chinantla suggested that local marketing of wild and semi-wild cultivars can provide future vertical market integration for farmers (Bost 2009). Bost's research developed many options for participatory domestication of the well-loved *chinene* fruit, *Persea shideana,* a relative of avocado, provided that local farmers elaborated local agroforestry systems for seedling production and marketed fruit sales (Bost 2009). Both García Hernández's and Bost's studies demonstrate useful and timely research on the value of wild edible plants for community members' own uses for edible plants, as well as ways that they configure into creating food sovereignty via indigenous-controlled modes of trade that can support their biocultural reproduction.

The Santa Cruz Center for Canning, completed in 2014, was a step toward women articulating a community-managed enterprise that supported food sovereignty. The center's commercial-grad kitchen accommodates over a dozen cooks at once, offering a community space for commercial-grad preservation of wild edibles and locally-cultivated foods.[21] Santa Cruz women produced marmalades and learned hot-water bath canning to preserve wild fruits and to pickle *tepejilote*, demonstrating the adaptability of women's TCK to new technologies as a way of saving money and labor time (Fonte 2008; Gvion 2012). Furthermore, acquiring new skills and using commercial cooking tools was a way for women to articulate their own meanings of belonging and shifting within their contextual ethno-ecosystem (Fonte 2008; Gvion 2012; Magaña González 2015). Unfortunately, there were no consumers to purchase the products, no market location to display or sell them, and no clear distribution chain for placing them in stores in market towns like San Felipe Usila or Ixtlan.

Considering these market constraints, I recommend that the creation of a marketing board for Chinanteco products could be an important next step in the direction of leveraging income from wild food sources. Marketing of wild foods should be approached with caution though, because it poses a risk of exposing unique, potentially rare wild plants and their relative customary role within TCK to outside exploitation. Such has been the case among countless indigenous groups and wild plants, such as acai berries and kava root (Ruiz Muller, Angerer, and Oduardo-Sierra 2015), which the Convention of Biological Diversity aimed to protect with the amendments in the Nagoya Protocol in 2010. It is critical to create legal protections for

[21] At the time of research, the Santa Cruz Center for Canning wasn't in operation, due to a lack of funds to run it and organizational clarity, nonetheless the social and material infrastructure are in place, and women hoped it would be up and running soon.

internationalized sales of biodiverse plants, and should wild plants be detached from the context of their use, Chinantecos will have to accept the potential risks for exploitation. Yet, several cases of indigenous groups' cultural survival have flourished from the development of sustainable community-managed enterprises (Stevens and De Lacy 1997).

Human Rights to Food: Interference or Support by the State?

In protecting women's rights, the PROSPERA curriculum should support the preservation and heritability of indigenous women's knowledge about native foods. The conditions for receiving cash should value women's productive labor as the primary stewards of seed conservation, and value women's reproductive labor with specific regard to their ethnic and racial culture. On several occasions, PROSPERA's curriculum was incompatible with food sovereignty because it generated a cash-based incentive for women to ingest, feed and purchase non-native foods (Adato 2010). Women knew that their traditional foods were healthy for them, but the program would be better suited to the population if it considered that women's connectedness to their own foods and place-based familiarity with that food would support their trust and adoption of dietary practices. PROSPERA should include specific nutrients and foods within the existing Chinantla agroecosystem for indigenous mothers. This would demonstrate a localized politics of place by recognizing that women's native environments and local foodways could both empower individuals and strengthen the heritability of TCK. Rarely did nutrition lessons include any traditional food ingredients, unless it was *ad hoc* by registrants in the audience. Chinanteco women don't expect a Federal program that generalizes nutrition advice to recognize the uniqueness of their TCK. However, by rewarding the transition to new diets through cash payments, TCK is undervalued in the neoliberalized programmatic behavior of

PROSPERA, and reinforces a national conventional agribusiness politics of place that prioritizes homogeneity over diversity, and corporate profit in the name of "poverty-aleviation".

The Crusade Against Hunger established in 2008 was one of the main responses by the Mexican Government to address maize shortages among smallholders, but their introduction of non-native maize was seen as a direct assault to the traditional agroecosystems and TCK. In his 2010 report on Mexico, UN Special Rapporteur Olivier de Schutter said that a primary concern of Crusade Against Hunger should be, "ensuring that Government food support programmes [sic] such as DICONSA [. . .] source more of the food supplies locally from small-scale producers." (de Schutter 2010.) Additionally, this research adds that nutritional programs should include in their curricula native and local foods and medicines that are valued within local TCK, such as wild plants that support lactation. Including local solutions to lactation would address infant nutrition and support women's knowledge by addressing the first food: mothers milk. Furthermore, the biocultural relationships that women form with the environment would be bolstered by officially mentioning the role that wild and local agrobiodiversity plays in nutrition programs.

Taking the lead from other organizations in Oaxaca would be a good first step in developing a community-based organization that prioritizes the local supply chain, women's voices and TCK. For example, the civil association Puente, based in a suburban region outside Oaxaca City, is an organization that works between the state and community members to offer place-based nutrition education in combination with agroecological training workshops. Their programming integrates traditional foods, primarily amaranth, a native grain within the socio-ecological context of Oaxacan foodways. Amaranth has been promoted for its adaptive quality to soils, legacy as an indigenous plant to the region, high protein and micro nutrients and versatility

as an ingredient within local culinary dishes, such as tortillas, beverages and snacks. The development of a similar community-led organization in the Chinantla could assist in modifying state-based nutrition programming, like that of PROSPERA, to integrate amaranth or other native and wild foods into nutrition programming and advances in TCK that integrate the objectives of agricultural support programs with improved public health outcomes. In this case, the food sovereignty objective of supporting women's rights would then be addressed through state-based programs.

Women's Underrepresentation in Communal Governance

Women were highly underrepresented in communal governance at both case study sites, which highlighted how contributions and responsibilities of women's knowledge in the private spaces of the home were also underrepresented. Without representation at the local level, women's experiences, perspectives and responsibilities can only be indirectly *re*-presented by their husbands, sons or fathers. Language barriers limited some women's full participation in communal governance, since they didn't speak Spanish fluently or confidently. The requirement for Spanish-language communication in local governance alienated women's participation that may have dire long-term consequences of biocultural diversity for future generations. Women's underrepresentation in communal governance and CORENCHI detached their agency from full participation in economic and nutrition programs offered through state agencies because it didn't take into account factors that matter for women at home or across time: it can be seen as the contextual disenfranchisement of women from place-based politics (Harcourt and Escobar 2005).

Santa Cruz had more women involved in communal governance, that is to say, more women held titles there than in San Pedro. Of the two women who held titles as CORENCHI Community Technicians, one was disinterested to participate further. She had worked in her

CORENCHI role for three years, which absorbed valuable time she wanted to use to tend to her home garden duties and church activities. She didn't want to exert the effort and expend the additional time for holding a communal title, and performing its associated responsibilities. The other woman was enthusiastic to contribute, but she was also the daughter of a prominent community leader, so her family accommodated her duties to continue working in that capacity. In both case study sites, women could fulfill their family obligations in the household without scrutiny of their education and language skills, whereas in community governance spaces such as the General Assembly or assignment of titled responsibilities, women were often at a disadvantage because social, political and education norms conditioned women to work in the home. On average, the small minority of women who voluntarily participated in community governance took on the burden of representation of all women, within male-dominated governance bodies.vOn rare occasions, public school teachers spoke up on issues that affected families as they pertained to mothers and children: San Pedro's Mother Day Festival however, highlighted the problematic reliance on teachers from outside the community.

It's important that the communal governance processes can comprehend and address the incentives, opportunities, and benefits from more equitable representation of women in all offices and programs, particularly because women's roles as teachers and bearers of knowledge about traditional cuisine and agrobiodiversity must be an integral part of local governance structures. At the time this research was conducted, CORENCHI faced a predicament in choosing whether or not to expand their scope into a new market mechanism REDD+. If they wanted to join, they would do so through an alliance with Mechanism Dedicated Specifically for Indigenous People and Communities (MDE, *Mecanismo Dedicado Especifico para los pueblos indígenas y comunidades locales).* MDE required that the next president of CORENCHI be a

woman. According to the incumbent President, he is supportive of a woman becoming the next President, but also indicated the role requires administrative and leadership skills, and regular solitary automobile driving and travel to cities for attending meetings, which may deter many women from being elected to the job.

No woman has ever held the title of President of the Commissioners' office nor the Agency office in either of the case study cites. Women's representation would herald crucial community-wide benefits for the consideration of women's knowledge and issues they confront when managing the home, kitchen and home patio gardens and how such individual factors influence nutrition, health, seed conservation, the future of TCK and food sovereignty. Women's equitable representation and participation should be a major goal for these communities' communal governance bodies and future state-sponsored intervention programs, for it addresses a central tenet of food sovereignty that prioritizes women's rights and knowledge in governance. More broadly, it is important that all actors interested in food sovereignty – states, communities, NGOs and scholars – must turn greater attention to the interlinked role that traditional culinary knowledge plays in protecting both cultural diversity and biodiversity.

Climate Change

This research showed farmers' perspectives on how climate change has contributed to declining crop yields through extreme rain events and high heat spells. Combined with the market-based mechanisms of PEHS, their experiences support the argument that neoliberal policies have made it difficult for farmers to implement strategies for protecting them against climate variability, as has been seen in another study in southern Mexico (Eakin 2000). Climate scientists have predicted that, by the 2060, developing nations are likely to experience large losses in crop yields, averaging a −9 to −11% decrease from a baseline year of 1990. Contrasting

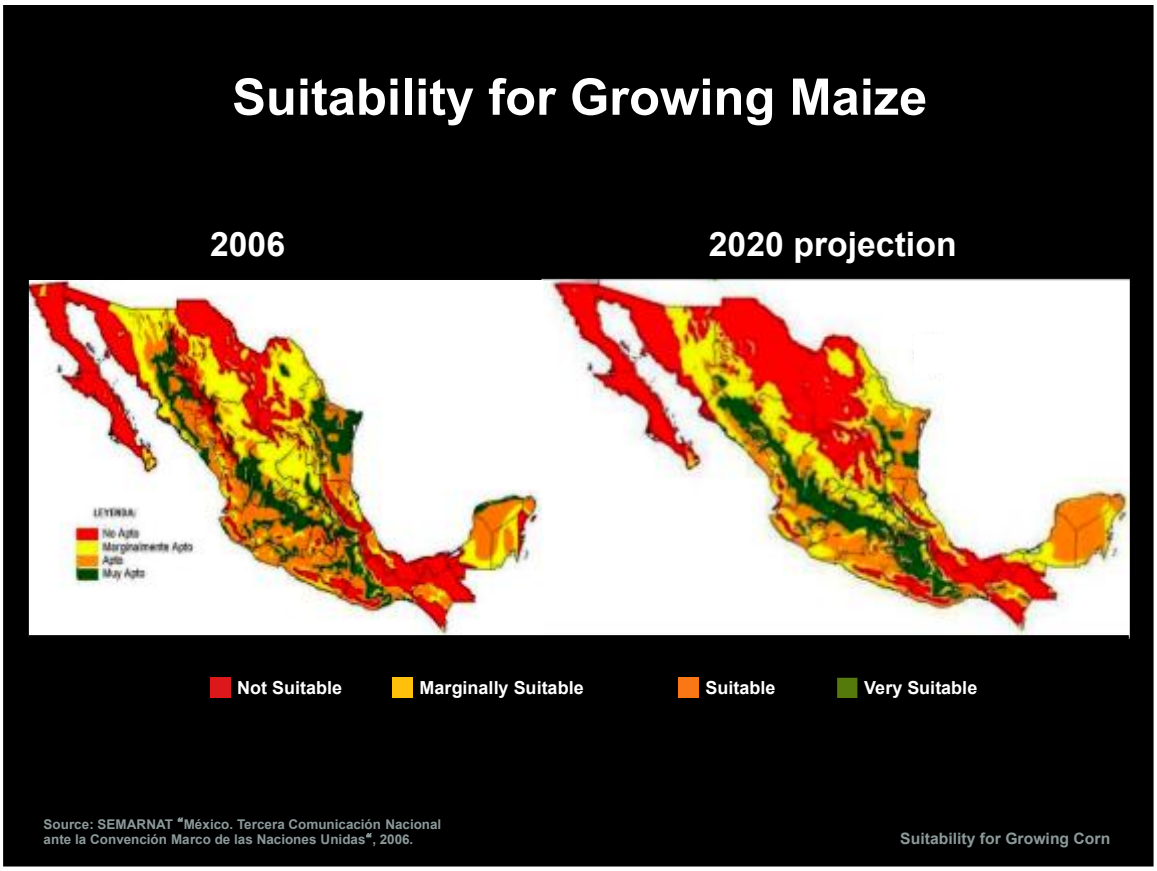

Figure 5. Suitability for Growing Corn. Source: SEMARNAT "México, Tercera Comunicación Nacional ante la Convención de las Naciones Unidas", 2006.

with developed countries, where production is estimated to increase, climate change in Mexico is predicted to widen the gap of indigenous agrarian populations' food security, based on disparities in crop yields between the developed and developing countries (Parry, Rosenzweig, and Livermore 2005). Additionally, Chinantecos expect that their crop yields and plant maturation will decline, based on education about the topic, distributed by Geo Conservación. In a lecture presented to CORENCHI delegates and the Santa Cruz Assembly, climate change was predicted to decrease the suitability of certain regions for growing maize (Figure 5).

The map presented showed that conditions were highly suitable in 2006, but farmers indicated terrible crop losses in 2008-2013, which fit with the 2020 projection that conditions will highly variable in the state of Oaxaca, specifically in the Sierra Madre where the Chinantla

is located. CORENCHI delegates implicated these climate change predictions for decreased maize yields in Mexico as a social deterrent for motivating youth repatriation of native seeds and the heritability of a contextualized Chinanteco agrarian livelihood. Thus, climate change and neoliberal economic policies are expected to have an increasing influence on the heritability of native and *criollo* foods, as well as TCK and food sovereignty.

Conclusion

From organized movements, such as *Sin maíz no hay país y sin frijol tampoco* to Mexico's award for Intangible Cultural Heritage from UNESCO, it is evident that traditional culinary knowledge is in need of protection. Government-based organizations that support the cultural preservation and biodiversity conservation must address the integration of TCK into their protocols and local programming. This study has shown that women in this region of Mexico are the stewards of TCK and its heritability to future generations depends in large part on women's political inclusion and representation in matters of communal governance.

TCK offers a powerful means of embodied memory, social agency, and a politics of place. The Chinanteco communities in this study demonstrate an example of indigenous resilience in the state of Oaxaca, and the interconnection between agrobiodiversity, seed conservation and TCK. These communities haven't developed sufficient strategies to cope with the nutrition transition towards industrial food that has come with highway development and hydroelectric energy projects, which have threatened their water, traditional food systems and sovereignty. This research offers an examination of how indigenous women's knowledge is certainly at risk, exemplified in how TCK it is at the intersection of cultural and gender discrimination, and that it is a form of biocultural knowledge that has the potential to improve the social equity in Mexico beyond.

If researchers and government programs want to ensure an agrobiodiverse future that conserves cultivated and wild edible plant varieties, they must look farther afield than the agroecosystem. Government programs, including CONAFOR's PEHS and PROSPERA's CCTs should integrate local traditional customs, knowledge and culture for future programming so that they contribute to the preservation and protection of indigenous TCK. Indigenous landholders have received direct PEHS as a way to place incentives for the state's definition of conservation,

but such payments are contingent on limiting their traditional farming, hunting and cultural activities with consequences for TCK. The state's conditional cash payment plan PROSPERA has been reviewed and monitored to advance cash to households to support improved health and nutrition outcomes, but the programming has not focused on integrating traditional and wild foods into the curriculum and required supplemental pregnancy nutrition, which also limits TCK. Although community members need and use income from these programs to address poverty, the restrictions and conditions those recipients were required to adhere to were incompatible with TCK. Individuals needed income stability at the household level first, and they could not be expected to spread this capital into community-wide projects and local development until their household needs were met. Additional financial support should be directed towards local stewardship for community-based management organizations, like CORENCHI, the Community Kitchen, and development of health and transportation infrastructure. As indicated by respondents themselves, these changes are the surest way to improve health and nutrition, generate income that will circulate locally and promote not solely cultural preservation but a transition towards cultural prosperity and the conviviality of eating together in community.

Appendix

Interview Guide

Part I. Farming Activities

1. What do you grow on your farm and what do you use the different crops for?
2. What are the most important crops you harvest for your family? Why?
3. Do you think it is important to grow many different types of crops or varieties? If so, why?
4. Are there certain crops or varieties that women are responsible for?
5. Has anything happened during your life that has changed the crops or varieties of food you eat?
6. Have any major historical events changed the crops or varieties you eat?

Part II. Seed Conservation Activities

7. Where do your seeds come from?
8. Which seed varieties or crops do you buy and which do you save from harvest?
9. Do you have adequate yields for your household food needs?
10. Do you have days when you don't have harvested food to eat?
11. How did you learn how to save seeds?
12. Why do you save seeds?
13. Other than for planting, what other cultural practices do you use seeds for? *(Ex: ceremonies, celebrations, holidays, collection for aesthetic appearance, etc.)*
14. What stories or legends do you know about seeds?
15. Are there seeds or foods that you used to grow or eat that no longer exist?
16. If so, why are they rare or gone? Why did they disappear?
17. What do you think would need to happen in order to prevent varieties from disappearing in the future?
18. When you select seeds from your harvest, do you look for any characteristics that are important for traditional cuisine? [If yes, probe: can you tell me more?]
19. Who is responsible for saving and selecting seeds?
20. Besides saving seeds, are there other things you do to make sure there are lots of different types of seeds in your community or farm?

Part III. Traditional Culinary Knowledge

21. Who cooks in the household? [If "me", probe: How did you learn to cook?]
22. Are there any foods you prepare that you think are distinctly Chinanteco?
23. How have traditional Chinanteco dishes changed in your lifetime?
24. What have been the consequences or benefits from these changes?
25. Are there any traditional dishes that have been meaningful to you in your life? [If yes, probe: Can you tell me more? Any stories that you have about these dishes?]
26. What practical skills or technical expertise is needed for preparing traditional foods?
27. What stories or meanings underlie these dishes?
28. What motivates you to cook traditional dishes or foods?

Part IV. Wrap-Up

29. How many family members live in your household? How many are away from the household for work?
30. Anyone who doesn't live here anymore?
31. What is your approximate age?
32. Any questions for me?

Community Workshop Agenda - Santa Cruz Tepetotutla

Community Workshop: Agrobiodiversity
And Changes in Traditional Cuisine in the Chinantla Alta:
Review of the Results of the Food Sovereignty Certification (FSC)

Date and Time: 7pm – 9pm, April 24,25 or 26, as suggested by local authorities
Location: Multiple Purpose Room in Santa Cruz Tepetotutla Community Center
Co-Facilitator Participants: Community Researchers: 1) Master of ceremonies 2) Note takers 3) Housekeeping
Guest Participants: community elders, farmers, anyone involved in the food system who wants to participate, 10 – 25 people total

Materials to get:

- Refreshments of local origin: Tamales, Fresh Fruit Juice and Local Coffee
- Computers and projector to show data from http://soberaniaalimentariacorenchi.blogspot.mx/

Agenda

Intro (10 - 25 Minutes): Brief self-introductions of each participant. Brief commemoration of the FSC, introduction to "Xochitl" Shoshana Perrey and Request of Oral Consent for participation

Time Line and Elders' Stories (Theme 1, 45 Minutes): Review of elders' focus groups on the history of agriculture production, local economy, health, community nutrition and diet (historic changes: coffee production, the Cerro de Oro dam, and DISCONSA stores).

Agrobiodiversity (Theme 2, 45 Minutes): Centers on heirloom foods with cultural significance. What makes crops culturally significant in the Chinantla Alta? Crop yields: Which crops are the most abundant? Which are most frequently harvested and why is this so? Is this good? Why or why not? Do the FSC results show that farmers' practices favor agrobiodiversity?

Traditional dishes and foods, their uses y significance (Theme 3, 30 Minutes): List of favorite local dishes and their significance for participants. (Examples of uses and significance: relationships between family members or spouses, rites of passage, religious celebrations, political or community meetings, everyday food, medicinal foods to cure illness.)

Refreshments ~ served after the workshop

Recipes

The following recipes were referred to in the text, and were documented during participant observation. Women's oral tradition was to pass down recipes to their children through demonstration or enlisting their help in the kitchen. Women didn't write down exact quantities of ingredients, but instead indicated amounts based on the more flexible amounts such as "a handful", a "little bit", "two pinches" or a "bunch." In cases where an amount was a small spoon or a cup, I estimated the amount relative to a US measured teaspoon or cup. Most important to keep in mind is that the following recipes' ingredients were approximated, rather than measured precisely, because women didn't write down recipes. In reproducing their recipes, I supplemented the approximations with measurements, so that a sense of proportion could be attained in order to prepare the dish.

* * *

Nixtamal Masa (Maize Dough)

Recipe by Doña Filiberta Osorio Timoteo, Santa Cruz Tepetotula

Makes approximately 1-1/2 - 2 gallons

Ingredients

- 9 lbs/4 kgs maize white or yellow maize
- 2 Tbs *cal,* or slaked lime (sodium carbonate)
- bowl of water

Nixtamal masa is a two-day process: the first day requires the preparation of *nixtamal*, or lime-soaked maize, and the second day is for milling the maize and forming into dough. Prepare the maize the night before you'd like to serve the tamales. The second day, mill the *nixtamal* and form the dough.

Day 1: Combine *cal*/slaked lime, maize and water to cover in a large 12-quart pot. Cook over medium flames and boil the maize for one hour, stirring occasionally to reincorporate foam into the mixture. Add hot water if necessary to ensure submersion of all maize so it cooks evenly. Remove from heat, then set aside to rest overnight, covered with a cloth to allow evaporation. This stage of lime-prepared maize is referred to as *nixtamal*, before it is milled into a dough, or *masa*.

Day 2: Rinse the *nixtamal* thoroughly, draining the liquid until it runs clear. Place it in an electric mill, or hand mill, adding water when necessary to decongest the mill plates. Collect the wet dough in a large bowl. Roll all the dough into balls setting aside into a second large bowl. The amount of dough used for different recipes will vary. For tortillas, dough balls the size of a tennis ball will produce a 12-14" wide tortilla, about 1/16" thick, whereas for tamales the same size ball should be about 3/4" - 1" thick and 8" wide.

* * *

Black Bean Tamales

Recipe by Doña Filiberta Osorio Timoteo, Santa Cruz Tepetotula
Makes 60 tamales

Ingredients

- *nixtamal masa* (9 lbs/4 kgs maize)
- Spiced beans
- 30 *guasmol* leaves or 20 banana leaves, toasted
- 5-gallon pot with steam-rack insert and lid
- 4 arbol chilies

Spice Mixture

- 1/8 white onion, chopped
- 1 clove garlic
- 1 Tbs "little palm" cilantro seeds
- 6-7 *arbol* chilies, roasted on the grill, no need to de-seed

Beans

- 1 cup hot water, heated over stove, but cool enough that you can touch it
- 1 TBS vegetable oil
- 2 pinches of salt
- 1 kg black bush beans
- 3 garlic cloves, whole crushed
- generous pinch salt
- water to cover beans

Beans: Grind all ingredients of the spice mixture in an abrasive mortar and pestle, or process in a blender. Add to a large 4 qt pot with beans, garlic cloves, water and salt. Cook beans in enough water to cover until tender (approximately 45 minutes; time will vary according to variety). Drain the liquid, reserving 3 cups in a small bowl. Place beans into a hand mill and process a smooth paste into a bowl. Flush the mill with a quick pour of the reserved water on occasion, so beans don't congest the mill plates. Reheat the paste in a *cazuela*, or large sauce pan, over low flames, stirring in the remaining water ~2 cups, until texture is smooth.

Assemble the Tamales: Clear and wipe down a work table for folding the tamales. Set up a pile of toasted wrapping leaves, a bowl with *hoja santa* leaves, the beans, the masa balls and a platter for folded tamales. Pass each of the leaves over a flame to tenderize, then wipe clean. With a pair of scissors or a sharp knife, cut the *guasmol* leaves into halves, or the banana leaves into thirds, so the wrapper is approximately 25-30" long, or an arm's length. Press the dough balls in a tortilla press with plastic-bag liners, place centered onto wrapper leaf. Spread the *masa* with a heaping spoonful of beans (approximately 2/3 cup), add 2 pieces of *hoja santa* on top. Fold the long sides in first, then fold the ends over second, enveloping the filling two-fold. Stack the tamales onto a platter, with the open-folded side down to hold it in place.

Cook the Tamales: Place the steam-rack in the bottom of the pot, and place the pot on the grill over a cold stove. Fill the pot with water until it's approximately 1" or a thumb-joint's length below the grill. In a radial fashion, load the tamales, then place roasted chilies on top of them. Line with plastic wrap to keep the steam in if the pot lid isn't tightly-fitting, then place the

lid on. Light the fire on high, steaming the tamales for one hour. Carefully remove the plastic wrap and let cool for 15 minutes. Place on a large platter and serve with chili *salsa*. Remind your guests to remove the leaf wrapper before devouring!

* * *

Empanadas de Cocolmeca (Maize Pockets with Wild Asaparagus)

Recipe by Lucía Robles Sabino, Santa Cruz Tepetotutla
Makes 4 large empanadas

Ingredients

- *Nixtamal masa* - 4 cups
- Cocolmeca - 2 long vines (2 cups chopped)
- 2 chilies de arbol
- salt to taste
- hoja santa - 2 leaves chopped, approximately 2 teaspoons
- cilantro - 1 bunch

Roll 1-1/2 cups of *masa* into a ball, then flatten into a thick tortilla (1/4") with a tortilla press or with your hands. Lightly boil the *cocolmeca* in water with chilies and salt, then drain. Fill the tortilla with about 1/2 cup of the cocolmeca, pieces, 1/2 leaf of *hoja santa*, 3 small sprigs of cilantro and a pinch of salt. Fold in half, pinch edges together in a decorative pattern with your fingers, and cook on both sides on a hot comal for 3 minutes each or until tortilla is cooked.

* * *

Pilte of Hoja Santa with Eggs (Herb Pocket filled with Eggs)

Recipe by Doña Filiberta Osorio Timoteo, Santa Cruz Tepetotula
Makes 1 serving

Ingredients

- 2 *hoja santa* leaves
- 2 eggs
- 4 maize cobs
- salt

Place four degrained maize cobs in a square formation on a high heat *comal*, or griddle. Arrange two stacked hoja santa leaves with their edges lifted upon the framework of the maize cobs. The bottom one will be discarded, because it will burn from the heat of the *comal.* The *hoja santa* leaves should form a basin inside to cook the eggs. Crack the eggs into the basin and cook them slowly, rotating the leaves around if they start to smoke too much. Sprinkle salt onto the eggs, then fold the leaves in half, around the egg so you can flip it. Discard any portion of the burnt leaves. Eat it just like that!

* * *

Albodingas-Plantain Dumplings

Recipe by Doña Filiberta Osorio Timoteo, Santa Cruz Tepetotula
Makes enough to feed a family of 8-10 people

Dumpling Ingredients

- 8-10 green plantains
- water
- Beans

Spice Mixture

- 1/8 white onion, chopped
- 1 clove garlic
- 1 Tbs "little palm" cilantro seeds
- 6-7 *arbol* chilies, roasted on the grill, no need to de-seed

Beans

- 1 cup hot water, heated over stove, but cool enough that you can touch it
- 1 TBS vegetable oil
- 2 pinches of salt
- 1 kg black bush beans
- 3 garlic cloves, whole crushed
- generous pinch salt
- water to cover beans

Mill plantains raw through a hand mill, to make a *masa*, then form the dough into little balls the size of a walnut. Imprint your thumb in the middle to make an indentation, resulting in a bowl-shaped dumpling. In a large boiling pot, boil the beans, spice mixture and water until soft, approximately 30 minutes. After the beans are cooked all the way through, add more water to ensure there is about 2" of water above the beans, and bring to a boil. Add the albondingas slowly, and cook them for 15 minutes. Serve in a bowl with tortillas and fresh garden cilantro or minced green onion.

* * *

Barbacoa de Cabeza de Res - Roasted Beef Head

Recipe by Doña Ceinaida Cortez Lopez, Santa Cruz Tepetotutla

Makes approximately 20-25 servings

This recipe involved about 6 or 7 people. In the description below, I adapt the recipe to be made by 2 or 3 people. In other parts of Mexico, barbacoa, or barbeque, roasts meat in an underground pit. In this cook's Santa Cruz adaptation, it requires a tall 5-gallon kettle, and is cooked over a wood fire constructed on the ground inside the kitchen.

Ingredients

- 1 cow/beef head, scrubbed clean and all hair removed (plucked)
- 4-5 teaspoons salt
- 10 dry avocado leaves
- 6 medium white or red onions
- 1 pint *guajillo chili salsa*
- 1 kilogram white potatoes, cubed coarsely
- 1 kilogram carrots, chopped
- water to cover

Guajillo Chili Salsa

- 1 kilo dried *guajillo* chilies, sorted, deveined and deseeded
- 3 heads garlic, peeled and minced, approximately 1/2 cup
- 1 bunch cilantro
- 2-3 teaspoons salt, or more to taste
- 2 quarts of water

One person tends to the scrubs clean and removes or plucks all hairs and fur from a fresh cow head. Position it in a kettle that is tall enough so that there is 10-12" of additional space at the top, to accommodate boiling later. Cover the head with water and salt and place a lid on it. Chop the onions, potatoes and carrots, and add them to the kettle with the avocado leaves. While one person does this, two others prepare the chilies for the salsa. Clean the chilies by discarding any black or unsightly portions, then soak them in a bowl of hot water for an hour until soft. Reserve the water for later. Peel and chop the garlic, then combine in an electric blender with cilantro, salt and water. Blend the mixture, then remove and divide it into 4-6 equal portions to re-blend with the soaked chilies. Drain the chilies, reserving a few cups of water. Blend all the chilies in batches, adding water as needed to make a pourable sauce, then combine all into a bowl. Pour the salsa into the kettle and stir with all the ingredients. Wrap the top of the kettle with plastic wrap to assure that heat and steam don't escape, then place lid on top. Boil the beef head mixture over high flames for 1-1/2-2 hours, feeding the fire continually to assure a high boil. Check the doneness by removing and tasting the meat with a fork. It should be very tender and fall right off the skull. Serve in bowls with tortillas, and toast with a glass of *mezcal* (agave liquor) or *aguardiente* (sugar cane liquor).

* * *

Beans and Plantains

Recipe by a Kind Anonymous Woman from San Pedro Tlatepusco
Makes 8 servings

Ingredients

- 1 kilogram black beans
- enough water to cover the beans, double the volume of beans
- 2 teaspoons salt
- 8 green plantains, cut into 1/4" thick slices
- 1 clove of garlic, chopped
- 5 tablespoons vegetable oil

Rinse and drain the beans, and place into a large pot with double the amount of water to boil, with 2 teaspoons salt. Light 3-4 pieces of firewood, place pot directly on top of the flame and boil 1 hour while feeding more firewood to maintain the high flame. Remove peels and slice plantains, set aside. Heat the vegetable oil in large sauce pan, then fry the garlic for 5 minutes on low flame. Increase flame and add plantains, frying on all sides until golden. Add beans to the plantains, then return to a boil on high for 10 minutes. Serve in a bowl with tortillas on the side.

* * *

Cacao Prepared Three Ways

Recipes by Isabelle Tolontino Ambrosio, San Pedro Tlatepusco

Harvest cacao pods, crack open and remove seeds and pulp. Sun-dry the freshly- harvested cacao seeds in their own pulp for 10 days, atop a woven palm mat on the ground in the home garden patio. Once the moisture is fully evaporated, the pulp has dried and should smell sour and fermented. Gather the cacao seeds, and use or store in a dry plastic or woven vinyl bag. There are two types of cacao in San Pedro. The more common is called white cacao or *blanco*, which is a non-native variety, mild in flavor, and needs less sugar in preparations. Peel off the skin, then roast it on a comal for about 10 minutes, turning to achieve even brown color on all sides, before making a beverage. The second type is little tiger cacao, or *tigrillo*, a *criollo* variety that tastes more bitter, so it needs more sugar[22]. Isabelle's family, and many other families, have both kinds of trees, but prefer the white cacoa because its sweeter. Roast with the peel, because it's easier to remove afterwards. Place on a comal and roast for 10 minutes, turning frequently to achieve even roasting. You won't seed the color change because the seeds are such a dark color, so you just have to taste one to assure its done. It should have a crumbly texture, and a roasted flavor instead of simply a bitter flavor. Test an unroasted seed to taste the difference.

***Popo*:** Combine and mill dry maize flour (not *nixtamal*), cacao, sugar, *cocalmeca*, water in an electric blender, or a *molcajete* (mortar and pestle) and bring to a boil in a pot for 2 minutes, then froth with a wooden whisk and serve hot in a drinking gourd or a cup.

Hot Chocolate: combine and mill a dry powder mixture of cacao, sugar and cinnamon. Store the powder for later in an airtight container, or use immediately. To prepare a cup, add the desired number of spoonfuls to water and bring to a boil in a pot over low flame, then serve hot in a cup.

***Atole*:** combine *nixtamal masa*, hot chocolate powder (as indicated above) and water in a pot and boil on low flame, stirring constantly until it reaches the desired temperature. Serve hot in a drinking gourd or a cup.

* * *

[22] On occasions when they have a buyer, white cacao sells for 25 pesos/kilo, whereas little tiger sells for 10 pesos/kilo.

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